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ABSTRACT

Presented in this quarterly publication are reviews, highlights, and 402 annotated bibliographic references from current and international literature in the area of science and public policy. The term "science" is used here to denote both engineering and technology as well as science. The literature reviewed includes books, reports, and periodical articles and focuses on matters of broad public policy; that of a highly technical and narrowly specialized nature is not covered. In addition to the bibliographic entries, this issue includes three articles: (1) "Whither Science and Technology?" a thought-provoking observation on the new look of today's scientific and technological climate; (2) "Influences on the Course of Science and Technology," an analysis of the forces exerted by society through industrial organizations, the Government, and the public, which are pushing the scientific/technological establishment; and (3) "Israel-Egypt Science Gap," an interpretation of observations gained from touring research facilities, written in the form of a treatise comparing Isreal's and Egypt's abilities to utilize science and technology for national purposes. Both an author index and a subject index to Volume Four are incorporated in this issue. (BL)

Science Policy Reviews

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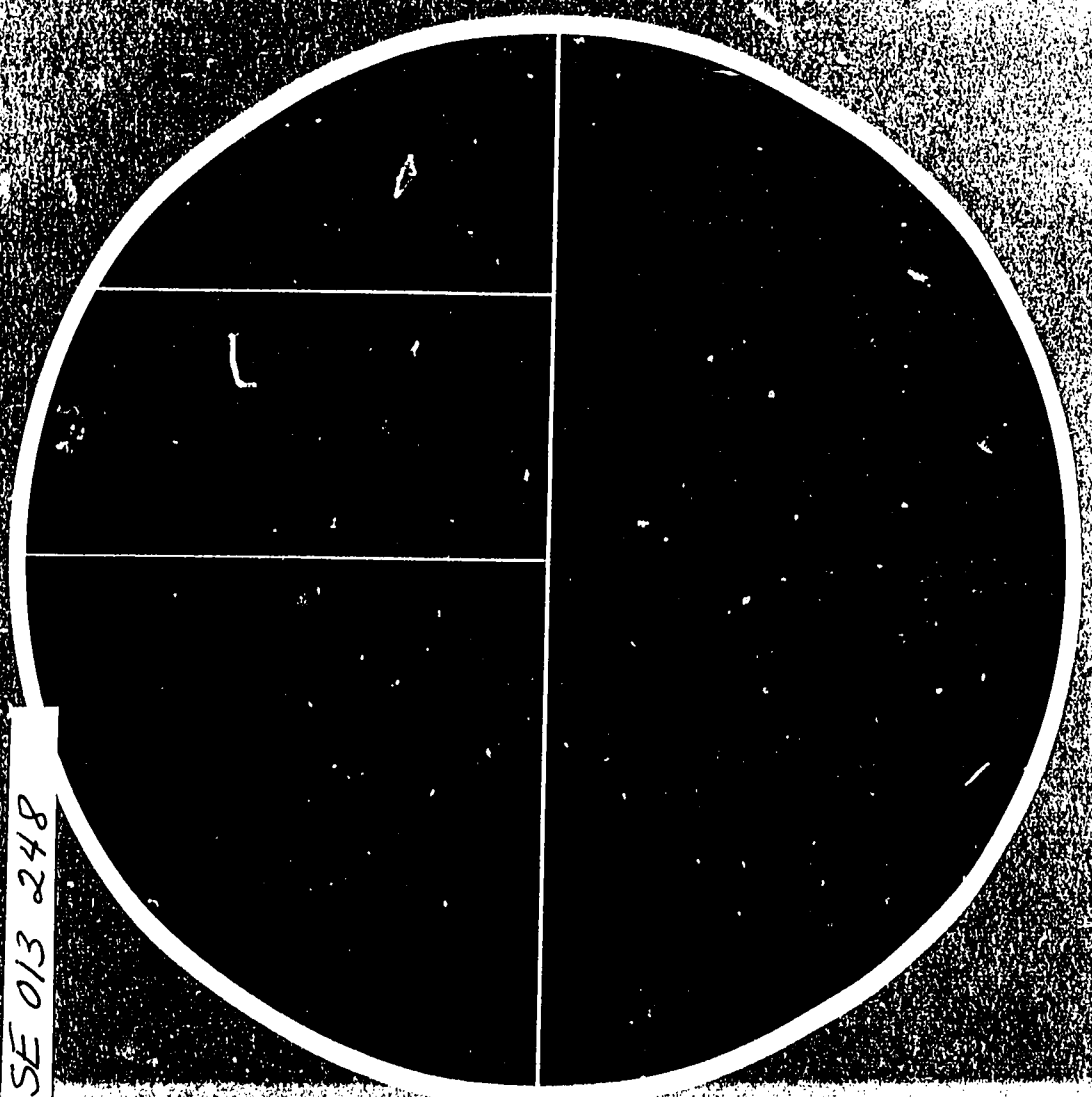
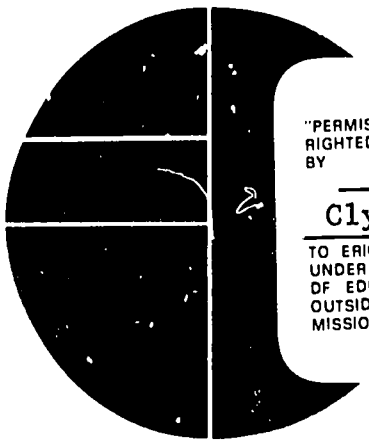


Science Policy Reviews (formerly Science Policy Bulletin) presents reviews, highlights, and annotated bibliographic references from the current national and international literature in the area of science and public policy. For brevity, the word "Science" in the title of the Reviews is used to denote engineering and technology as well as science

Science Policy Reviews is intended for individuals and organizations engaged in studying, formulating, or implementing public policy relating to science and its applications. The literature reported in the Reviews includes books, reports, and periodical articles. The regularly screened periodicals are listed on the inside back cover. The focus of the literature reported is on matters of broad public policy; literature of a highly technical and narrowly specialized nature is not included.



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About This Issue

I trust you feel, as I do, that 1971 was a good year for *Science Policy Reviews*. I appreciate the many letters and notes you have sent with comments and suggestions for our publication. Naturally, we cannot provide a perfect solution to everyone's wants and needs. However, I hope we are responding reasonably well to the mainstream suggestions. Please continue to share your thoughts with us.

Appearing in this issue for the first time is a name we hope will become a familiar *Reviews* byline — Gabor Strasser. Prior to joining the staff of Battelle's Columbus Laboratories, Mr. Strasser was Technical Assistant to the President's Science Advisor. He was responsible for technology assessment, criteria for research and development, and program review and planning. He worked closely with the President's Science Advisory Committee (PSAC) and served as the Executive Secretary of its Panel on Science and Technology Policy. Prior to that, Mr. Strasser was Vice-President for Planning at the Urban Institute in Washington, D.C.

In his new post — Director of Planning — at Battelle-Columbus, Gabe, as he is known to his Battelle colleagues, will identify and assess national and international needs and trends, with specific emphasis on science and technology. His efforts will be directed toward helping Battelle better focus its resources for solving existing problems, as well as toward identifying future opportunities.

Because of Gabe's wide-ranging knowledge of science, technology, and research and development — gained from a unique vantage point — we feel that his views will be both interesting and helpful to all those involved in science policy.

An important feature of this issue is the card contained in the centerfold. This is our periodic check on our readership and their mailing addresses. As I am sure all of you realize, we, like all other publications, have a budget. We try to maximize our readership within the framework of the number of copies we can produce with that budget. As a result, we give preference to libraries requesting to be added to our mailing list, and occasionally cannot add an individual's name to our list. It is of utmost importance that every copy we produce is being received by someone who wants and uses it!

To update and correct our mailing list, it is imperative that we receive from each *Reviews* recipient the card attached in the centerfold — completed, of course. If we do not receive your completed address-verification card by April 1, 1972, we will assume that you no longer wish to receive the *Reviews* and will remove your name from our mailing list. We will do this reluctantly and only because we have a list of individuals waiting to be added./CRT

Whither Science and Technology?

In the scant few months since Gabor Strasser exchanged his desk at the Office of Science and Technology for one at Battelle (see previous page), your **SPR** *editor has enjoyed many a "rap session" with him on science-policy perspectives gained in the course of his varied career — especially during the last two years as Technical Assistant to Nixon's Science Advisor. His comments are so rational, authoritative, and relevant that we want to share them with our* **SPR** *readers.*

Accordingly, here is the first of what we hope will be a continuing series of articles by Mr. Strasser. It gives his analysis and predictions (and he carefully points out that they are his own ideas and are not intended to reflect any official views) on where science and technology are heading.

WHAT IS IN STORE FOR OUR SCIENTIFIC TECHNOLOGICAL ESTABLISHMENT?

by Gabor Strasser

The Past Two Decades

During the 1950's and 1960's about two-thirds of our entire Federal budget was spent on national goals and priorities in the areas of defense (DOD), space (NASA), and atomic energy (AEC). Programs to develop new sophisticated weapons systems, to go to the moon, and to perfect large-scale nuclear power plants critically depended on scientific and technical contributions. Yet, the bulk of these huge expenditures went for such "unscientific" things as physical plants, materials, labor, tooling, production, quality control, administration, and financing. Only a small fraction was spent for science and technology, per se.

Hence, science and technology have enjoyed a unique combination of two desirable characteristics. They have been (1) critical to the attainment of our national goals and (2) "relatively" inexpensive. For these reasons, support for scientific and technical activities has grown at an unprecedented rate. There were no misgivings about such growth, and perhaps even less about the efficiency of the scientific/technical process as such. But why should there have been any? Not infrequently a multimillion-dollar hardware system production had to wait for scientific and technical breakthroughs which cost, in sharp contrast, mere tens of thousands of dollars – and often much less. In those days we decided what kind of military, space, or nuclear hardware we wanted, and then bought it. With this type of "cost effectiveness", performance goals usually took precedence over cost considerations, although efficiency was still one of our concerns.

Today, it behooves the scientists and engineers to realize that such past financial support for their activities was provided by our socio-political system not because scientists and engineers were loved, but because their contributions were both essential and relatively inexpensive.

Support for Science and Technology

The table below attempts to look at the rationale behind the funding for science and technology.

EXPENDITURES FOR SCIENTIFIC/TECHNOLOGICAL ACTIVITIES IN THE 1950's AND 1960's

(a) = approximation
(g) = guess

NATURE OF THE ACTIVITY / MOTIVATION FOR THE ACTIVITY	Abstract Studies ← Research & Development (R&D) → Fabrication & Testing			Total Relative Expenditure
	Basic Research[1]	*Applied Research*[2]	*Technology*[3]	
Support of National or Industrial Goals	$0.15(g)	$0.20(g)	$0.65(g)	$1.00(a)
Education and Training of Scientists & Engineers	$0.12(g)	$0.03(g)	–	$0.15(a)
Science for Science's Sake	$0.03(g)	–	–	$0.03(a)
Sum	$0.30(a+g)	$0.23(a+g)	$0.65(a+g)	$1.18(a)

1 – *Basic Research* – Fundamental research, whether targeted or not. Examples of targeted fundamental research are basic research in virology as supported by the National Institute of Health (NIH); or, basic research in hypersonic-flow as supported by the National Aeronautics & Space Administration (NASA).

2 – *Applied Research* – Any research that is intended to fill a well-perceived gap in the state of the art of some technology. Such perception is usually based on the realization that the existing technology is wanting in some regard, to help attain some objective, of whatever nature.

3 – *Technology* – The application of existing scientific/technical knowledge to the attainment of systems, goods, or services, of whatever nature.

One common breakdown of scientific/technical activity is by *NATURE OF THE ACTIVITY;* another possible categorization is by *MOTIVATION FOR THE ACTIVITY.* In our table, the former is the title of the column headings, whereas the latter is the title of the row headings. The matrix elements represent speculations on relative expenditures during the 1950's and 1960's.

Column headings, under the *NATURE OF THE ACTIVITY,* are (1) *Basic Research* (whether targeted or not), (2) *Applied Research,* and (3) *Technology.* What we normally call *Research and Development (R&D)* spans the last part of (1), all of (2), and the first part of (3), as indicated by the arrowheads.

As row headings, under the *MOTIVATION FOR THE ACTIVITY* we find: (1) *Support of National or Industrial Goals,* (2) *Education and Training of Scientists and Engineers* (mostly university research, but excluding applied contract research done in university laboratories), and (3) *Science for Science's Sake.*

As the last column shows, in the 1950's and 1960's in our scientific/technical areas, for every dollar spent on *Support of National or Industrial Goals,* only about 15 cents went for *Education and Training of Scientists and Engineers,* and a mere 3 cents was devoted to research for "seeking the truth", or *Science for Science's Sake.* These are approximate figures based on cross plotting existing NSF data, and are offered merely to illustrate coarse, relative magnitudes.

Further breakdowns into allocations for *Basic Research, Applied Research,* and *Technology* is difficult, because of overlaps among these functions and wide variations from program to program. Thus, the specific figures shown in the matrix elements as relative expenditures are, at best, considered guesses, for the various *NATURES OF THE ACTIVITY* in support of each of the three *MOTIVATIONS FOR THE ACTIVITY.* Irrespective of the accuracy of the figures, what is significant is that by far the lion's share of the expenditures for scientific/technological activities has heretofore been appropriated for the *Support of* (those) *National or Industrial Goals* that happened to depend for their attainment on science and technology. There is no reason to believe that the proportion will change significantly, even though the nature of the goals is changing and science and technology are much less crucial to their attainment.

A common mistake in the past has been to confuse *Basic Research* (the entire sum of the first column in the table) with *Science for Science's Sake* (the last element alone in this first column). We cannot afford to allow this confusion to persist! If we do, we will continue to argue for the support of *Basic Research* on the basis of a relatively small (3 cents worth) partial justification, rather than on the basis of a reasonable total justification, which is ten times as great.

New Goals and a New Kind of Cost Effectiveness

Today, as we approach the mid-1970's, changes are occurring as a result of at least the following two factors:

One, emphasis is shifting from space, defense, and atomic energy toward the alleviation of domestic social and environmental problems, or, in general, toward the improvement of our "quality of life". These goals are not so science-and-technology sensitive as going to the moon, as MIRV's, or as phased-array radars have been.

Two, we can no longer relegate costs to secondary importance. We cannot spend as freely as we used to. Even though over half of the cash flow in this country is funneled through Governments of one form or another (Federal, State, and Local), there is not nearly enough money to pay for all of the desirable programs in education, health, reduction of urban blight, solution of environmental problems, etc., to say nothing of essential continuing work in defense, aerospace, and atomic energy. In fact, worthwhile programs in almost any one of these areas *alone* could spend the entire Federal budget (or perhaps even the entire GNP).

Hence, instead of setting goals and pursuing them whatever the cost, today we are forced to try to figure out how to spend our limited resources most effectively, and often on programs which are not extensively science-and-technology dependent.

New Approach Needed

Another major change that is affecting our scientific and technological activities lies in the approach required to tackle today's emerging problems. What seems to be important now is not so much the advancement of the state of the art in any one discipline, but the integration of existing science and technology with what is already known and yet to be found out in sociology, economics, politics, management and institutional arrangements.

In other words, to address problems in such areas as pollution, social unrest, health, urban blight, and education, it is necessary to properly orchestrate the many disciplines involved, and then collectively focus them on the solutions to problems. Superposition (that is, looking at the social, political, economic, scientific, technological, and institutional considerations one at a time) simply does not work. This is so because end results, more often than not, are more sensitive to the nature of the interaction of these disciplines than to the singular contribution of any one of them. What we are facing today is not a technological crisis. Rather, it is a combination of institutional, managerial and financial crises.

For example, it would be very difficult to argue that low-cost housing problems could be better solved by research on geodesic domes. Low-cost housing does not suffer from insufficient advance-

ment of the state of the art in geodesic domes. Nor is it just a matter of bricks and mortar. The problems are rooted in a host of impediments, such as lack of communication and integration of resources and results, some union practices, obsolete building codes, financial woes, the complexities of our evolving social fabric, and a general deterioration of the existing low-cost housing stock. This last item is perhaps due to the fact that tenants in low-cost housing do not properly care for their abodes today, nor do they have any real incentive to do so in the future.

To make incremental improvements in the reduction of urban blight, or in other social or environmental ills, first we must establish relevant (rather than elegant) parameters in terms of the inputs from all the essential disciplines to which our end objectives are sensitive. Without such knowledge we are unable to decide what to manipulate and how. Regrettably, we do not know how to establish such integrated parameters today, nor do we know for that matter how to articulate our objectives with adequate specificity. We need indicators (urban, social, environmental, or whatever) with three characteristics: relevance, utility, and acceptance by the public. We do not have them.

Limited Success in Integrating Disciplines and Developing Indicators

A number of attempts are being made to develop such capabilities. The universities are trying. Some have set up interdisciplinary programs in such areas as urban or environmental studies, bringing together specialists from various departments to focus their collective talents on the solution of some visible problems of society. A major stumbling block lies in getting these specialists to subjugate their understandable (though not necessarily forgivable) overriding desires to advance the state of the art of their respective fields, rather than pool their skills to solve complex social/environmental problems most effectively, even if inelegantly. Many such attempts suffered an early demise. There are exceptions, of course, such as the program at UCLA, or the one at Stony Brook State University of New York, among all too few others. One of the most recent promising new attempts is the joint venture by The Ohio State University and Battelle, to establish an Academy for Contemporary Problems, with precisely the objective implied by its name and a one-million-dollar annual budget for the next ten years.

Within the National Science Foundation, the RANN (Research Applied to National Needs) program (successor to IRRPOS — Interdisciplinary Research Relevant to Problems of Society) was set up to implement cooperative efforts of the diverse specialties needed to cope with the very broad problems of society. To date, the RANN program has not lived up to the expectations of many. But the RANN philosophy requires such radical changes in NSF's traditional

modus operandi, that even the painstaking progress that is actually being made is an achievement. Hopefully, this will continue, and the rate of change (in the right direction) will increase.

Call for a New Breed of Engineer

What is really needed is a new kind of engineer (or whatever he should be called), who can do for our broad-based social systems what the systems engineer did in the 1950's and 1960's for our highly sophisticated technical systems. However, the emergence of such a breed will be a painful, uphill process, if the evolution of systems engineering is any indication.

The systems engineer came into being in the early 1950's because the old-type project engineer simply couldn't "hack it" when it came to developing complicated weapons systems or a space vehicle, or even a DC-7. This new type was accused of "knowing everything about nothing", or "knowing nothing about everything". But he learned, for example, how to integrate the contributions of the stress analysts, the aerodynamicists, the propulsion people, the avionics experts, the structures men, the metallurgists, and many others. He knew how to develop and combine subsystems in order to bring forth new-generation airplanes that took off, flew, stayed in the air, and landed safely, within specified performance envelopes. He was spawned not by the universities, but by the nonprofit "think tanks", by the major military contractors, and by the Government itself.

The universities were too busy and happy pursuing such things as plates and shells, computers, numerous aspects of electronics, supersonic and hypersonic flow, and many other researchable areas along familiar disciplinary lines. Of course, these were important, essential activities. But at the same time, the "mundane" power labs were all but shut down in electrical engineering departments, since most everyone preferred the more sophisticated, interesting activity of stretching the frontiers of electronics. And, only after systems engineering had thoroughly proven itself as a valuable tool (about ten years later), did the universities introduce systems engineering into their curricula. Now they even give Ph.D.'s in it.

The systems engineer developed slowly and in a difficult manner — by a trial-and-error interactive process with many blind alleys along the way. Yet his evolution was helped by the fact that the various technical and scientific inputs he was trying to integrate were already related by large enough interfaces to enable their practitioners to communicate without having to learn whole new languages. But the new breed of orchestrating or social engineer who is needed for today's social and environmental problems will have no such advantage — which partially explains why he is taking so long to emerge, why so many interdisciplinary efforts have bogged down, and why we are moving so slowly toward what must be interdisciplinary solutions to multidisciplinary problems of society.

The plain fact is that the universities could not or would not even face up to the simpler challenge in the past, to foster the spawning of the systems engineer in the 1950's, when problems were relatively simple, less urgent, and university administrations had more control (and I don't mean dictatorial power) over their students as well as over their faculties. Hence, it is unreasonable to expect that the university of today will take the leadership to bring forth the new breed of social engineer, or orchestrator, or whatever, whom we so badly need if we are to make the 1970's the beginning of a new and better era for all mankind on a "shrinking" earth. This task, of course, will be anything but easy, and not without considerable pain. But the payoff, if we succeed, as we must, will outweigh by many orders of magnitude the efforts that we will have had to put forth.

I believe that the most promising birthplace of this new "orchestrator" is again within the "think-tank" R&D community, including such nonprofits and industry groups as the Battelles, the Rands, the MITREs, the Aerospaces and such broader-based management-consulting firms as the A. D. Littles. These groups are beginning to make headway in mastering the art of interdisciplinary problem solving. Many of them were hard-science oriented, but they are perceptive enough to see that much wider capabilities must be combined to tackle today's problems. Admittedly, this will take place with university and Government assistance, but not leadership.

Short-Run Versus Long-Run Needs

What is needed *in the short run* (next few years) for the attainment of our emerging national goals and objectives is not primarily the further advancement of the state of the art in individual disciplines. What seems to be needed most is a better orchestration of off-shelf knowledge, as represented by the host of hard-to-relate, diverse disciplines. If this is true, then the demand for scientific/technical activities in the sector represented in row 1 of the matrix in the table shown earlier, namely, science and technology in *Support of National or Industrial Goals*, is likely to diminish in a relative sense in the foreseeable future. A diminishing of support of science and technology in this sector (which historically made up about 80 percent of the total support) can have traumatic effects and repercussions. We are experiencing some of these today, in terms of what is estimated to be about 100,000 unemployed or underemployed scientists and engineers. However, the *long-run* picture is quite different.

The rate of increase of our national productivity has begun to decrease, because the so-called service sector (which now represents over half of our total labor force) is not increasing its productivity nearly as fast as agriculture and industry have since the turn of the century. We, as a nation, cannot afford this massive depressing effect on our national productivity or efficiency, if we are to improve our

standard of living or "quality of life", without extensive borrowing or inflating.

Eventually, science and technology will again have to play critical roles in meeting national needs, such as in helping to improve our productivity, in improving our sagging international balance of payments with high-technology-intensive products, and in helping to generate the profits of industry (and thereby bolster the tax revenues of the Government, which are necessary to pay for the improvement of our "quality of life").

Therefore, while orchestration may turn out to be the primary need in the *short run*, I believe our ultimate salvation lies in the acceleration of an appropriate *new mix* of scientific and technological activities for the *long run*.

The Problems of a New Mix of Scientific Technical Activities

This issue of a new mix raises several crucial questions: (1) What should be the nature of this new mix? (2) How much of it will we need in the future, *vis-a-vis* how much of the "old" mix we needed in the past? (3) To what extent *can* today's scientists and engineers "convert" from their old, but not currently-in-demand, specialties to areas within the new mix that are now in demand? (4) To what extent will today's scientific and technical population *have* to convert? (5) In view of the likely disparity between (3) and (4) above, which kind, and how many of today's scientists and engineers should be seeking new careers in fields totally different from their present ones?

"Obsolescence" is a disturbing word; it is even more so, when it refers to people; and, it begins to border on the catastrophic should it describe us. But no one ever becomes obsolete, though his specialized activities might. Our native and acquired talents, as well as our disciplined, reasoned, scientific thought processes, in themselves represent great transferable assets. This is true, even though the specific areas onto which we have focused such talents may have ceased to be in vogue. Focusing these talents on the different and difficult problems of today takes will and courage. This is certainly not an easy task, but neither is it an insurmountable task.

Today we probably need only half as many aeroelasticians as we needed, say, 5 to 10 years ago. Does this mean that the aeroelasticians who are out of work are no good, or undeserving, or outcasts of society? Certainly not! They got caught in a supply/demand squeeze which is completely out of their control, but which very definitely affects their mortgage payments, and the piano and dancing lessons of their daughters.

Engineers are uncomfortable with anything that is not orderly or that is beyond their control, whatever the subject. Should the subject turn out to be their ability to earn a livelihood, the discomfort can

turn to severe pain. Obviously, this makes the whole situation a very personal sensitive issue, and hence one that is difficult to approach unemotionally, and hence rationally.

Our current generation of scientists and engineers have gotten used to occupational security, a security that could be increased by deepening rather than broadening their specialties. In the 1950's and 1960's if a bricklayer could see full-time work for six months ahead, he went out and bought a new car. On the other hand, if an engineer did not have two or three job offers in his pocket from other companies, he became nervous, and figured that something was wrong with him.

Engineers will have to learn not only to deal with dynamic, rapidly changing *things*, but also to become *themselves* more dynamic and more prone to change, as the world in which they live changes. Most of the carriage builders and horsewhip makers are gone today. However, it's a well-known cliché that had the horsewhip makers thought of themselves as accelerator-manufacturers rather than mere whip makers, perhaps they would be listed on the New York Stock Exchange today.

Whatever wrenching transition our scientific/technical community will face, it will have no choice but to confront it. It behooves the rest of the nation to help with this transition and confrontation. This is especially true, since increasingly effective leverages will have to be applied to our natural national wealth if we are to maintain the ever-increasing standard of living to which we have become accustomed. Science and technology has historically helped us provide such leverage, and will continue to do so in the future, unless the current "anti-science/technology" sentiment is allowed tc cause irreparable damage. Hence, in terms of our future well being, it would be a gross mistake to neglect the maintenance, if not the advancement of our scientific/technical estate.

Prognosis for the Future

In the short run, scientists and engineers must help better orchestrate our present resources and knowledge and focus them on overdue solutions to many of our problems. In the long run, we must magnify our natural national wealth. Historically science and technology have been most effective magnifiers. Eight out of ten items on the shelves of our stores today were not there ten years ago. Nor would they be there today, had it not been for science and technology. Hence, we must maintain and nurture the proper mix of our scientific/technical estate.

Our short-term needs are different from our long-term needs. Should we confuse the two, we will surely fail in meeting both.

A little over a hundred years ago Thoreau said (probably at Walden Pond — did he ever say anything elsewhere? —): "Our life is fritted away by detail . . . Simplify, simplify".

Today, a few miles from Walden Pond on the Charles River at Harvard, President Nixon's former Special Counsel, Professor Moynihan, claims that what we need today in America are "great complexifiers".

Who is right?

Probably both of them!

In Thoreau's time we were seeking fundamental bench marks, intellectual foundations, the clarity of which could only be clouded by too many fringes, qualifications and detail. Great ideas, speeches, and documents are simple and to the point, like our Declaration of Independence or our Constitution. They represent essential starting points — frameworks. There are not too many of them, and they are rarely directly implementable.

Today Moynihan is talking about the many-dimensional difficulties confronting us as we try to implement our Constitution and its Amendments in our times. He is talking about what I believe is akin to the need for interdisciplinary solutions to our multi-disciplinary problems.

And this, in essence, is what our short-term need is today.

Influences on the Course of Science and Technology

It is apparent to even the most casual student of science policy that our scientific/technological establishment is being buffeted in all directions by a host of forces exerted by society through industrial organizations, the Government, and the public.

A most perceptive analysis of these forces, their origins, and directions is contained in an address by Dr. E. E. David, Jr., Science Adviser to President Nixon, delivered in Texas on November 2 at the Robert A. Welch Foundation Conference on Chemical Research. **SPR** *was fortunate in obtaining the text of that speech, which we herewith share with our readers.*

THE INTEGRITY OF PURPOSE

by **Edward E. David, Jr.**

Changing Attitude Toward Science

At the end of World War II Vannevar Bush wrote a monograph entitled "Science – The Endless Frontier", in which he pointed to the value of basic research and outlined a blueprint for making the U.S. great on this frontier. His blueprint was implemented and since has been enormously successful. Bush's monograph is still relevant today. Although the problems and timing of events differ, Bush's outline will continue to be important in sustaining U.S. leadership in science and technology. As we look ahead into the 70s, it is very clear that past relationships between science and society will be transformed. In the 1950s and 60s, science and technology transformed society. In the 70s we will see a comparable effect of society on science. I would like to talk a bit tonight about the genesis of this movement and about its implications for all of us.

Between 1968 and 1971 the overall R&D budget of the federal government has fallen in real terms by about 20%. Though the dollar amounts do not show anywhere near this decrease, the erosion of funds through inflation has resulted in a substantially lower level of effort. As you all remember, the SST was voted down by the Senate. The reasons for this action and its merits can be debated endlessly, but I look upon it basically as a lack of confidence that the R&D community was producing a product beneficial to society at large.

Today we see many outward signs, not so much of overt anti-intellectualism or anti-science, but rather questionings of the real value of science and technology. I submit to you that we are beginning to see a "consumer movement" in science and technology – the society as a whole questioning the values, goals, and direction of these vital American enterprises.

Voices of Science's Consumers

I draw this conclusion from a number of contacts, both here and abroad. My sources are people in responsible policy-making positions who represent both industry and government. It was at a recent OECD meeting in Europe that I had the opportunity to speak with the Science Ministers of most of the Western nations and Japan. Few of these ministers are scientists in their own right, but they are all concerned with science as it influences their nations' well-being. Their views, of course, differed in degree, but overall, it was clear that science and technology are looked upon as being too important to be left to scientists and engineers any longer. I found this attitude directed not only toward technology and product development, but also toward science and research. These ministers represent the customers, or consumers, of science: industrial organizations, politicians, government, and those other segments of society which, in the aggregate, are the public. In a word, the consumer of science is society, so I am implying that society is having second thoughts about the worth of its investment and will soon be making new and unaccustomed demands on our community.

The manifestations of the consumer movement in science are widespread. For example, I have recently heard that a major steel manufacturer in this country has closed down its research laboratory, reputedly one of the best in the metallurgical industry. A similar move has been made by one of the automobile manufacturers. I hear reports of similar moves from other sectors of industry, all apparently a result of basic economic decisions in those industries. Some international industrial firms are moving large parts of their research abroad since it is apparently less expensive there.

Amidst this questioning by industry and humanists of the economic and other values of science and the environmentalists' questioning of its long-term values, we also see some contrary signs, indications that not everyone is unhappy.

Many businessmen are saying that we must preserve our industrial base of technology for the welfare of the nation. Politicians are perceiving that our research and development expenditures have not been adequate to maintain the vigor of our economy. The slowdown in R&D is being blamed in part for our declining trade balance and for our slowly rising productivity. Despite the counter-culture which damns technology, others are saying that more technology is needed if we are to solve the very problems that spawned the counter-culture. Within this topical controversy lies the genesis of new directions for science and technology in the 1970s. These new directions are signaled on the national level by both policy and action. Let me discuss these and what they imply for science and technology.

Federal Influence

The first significant trend is that science policy is becoming a part of national policy. This trend raises the broad policy issue of Federal influence in research which was addressed by two recent articles in the *New York Times* last week. The first was entitled "The Disestablishment of Science" and was written by the British scientist and author who is now director of the Council for Biology in Human Affairs at the Salk Institute, J. Bronowski. By "disestablishment" he means that science should be divorced from government in the same way that the church has been divorced from government in modern times, and in this country in particular. Through this separation he believes that science can be brought to a more enlightened and moral use in the society. A few days later, Dr. Albert Szent-Gyorgyi, the well-known Nobel laureate and author, took the opposite viewpoint. He believes that science cannot be divorced from the society which spawns it. He says that the solution to many of our problems is not to separate science from politics, as suggested by Bronowski, but by making science penetrate into politics. I found these articles interesting and I commend them to you. However, there is little doubt that events are moving in Szent-Gyorgyi's direction – more involvement of science with the Federal Government and on a broader front than before. Furthermore, the greater this involvement, the more influence political affairs will exert on science and technology.

Since World War II the Federal Government has selectively supported science and technology on the input side, that is, it invested money and effort in education and research which in the end were to produce resources for achieving national goals. In many cases, these goals were nebulous and ill-defined. There was the confidence that highly-educated people and a research "bee-hive" would in the end produce what the nation needed, whether it was in defense or space or the civilian market place. The activities thus supported were connected only loosely then to the output side, and in fact there were relatively few output goals stated explicitly on a national level, one exception being the Apollo moon missions. It is

not too much to say that traditionally science and technology were connected only by a thread to the eventual products which had an impact on society at large. Now this coupling is becoming stronger and in some instances being reversed. That is, the goals and products are being specified and resources established to create them.

Economic Growth No Longer Main Goal

Perhaps the issue where this is becoming most clear is the supposed antagonism between economic growth and the quality-of-life. I am sure you are all familiar with this polarity which has been the subject of much discussion. Indeed, chemists and the chemical industry are one focal point of the controversy. Another focus is the energy industry. But whatever the particular subject, technology and science are being judged by unaccustomed yardsticks. This is the theme of Harvey Brooks' study entitled, "Science, Growth and Society". In that study, he points out that the 1960s were an era when economic growth was paramount. In the 1970s, that seems no longer an end in itself. Indeed, at the recent OECD Science Ministers' meeting, the ministers agreed on three major directions:

- expansion of research, development, and innovation activities to meet social needs such as environmental quality, health, education, and urban development.
- continued stimulation of technological innovation in the economy to achieve quantitative growth, with special emphasis on its qualitative aspects.
- more effective management and control of technology in the public interest.

This implies a strong hand by governments on research and development. So it is important to ask how sound it is to set grand goals for society and to try to reach them through directed research. A case in point is the field of fusion power.

Early Fusion Efforts Premature

It did not take scientists too long after World War II to recognize the potential latent in the thermonuclear reaction. The control of this reaction was obviously the route to take if one were looking for a virtually inexhaustible supply of energy. The fuel for the fusion reaction would come from the sea. Its waste products would be minimal. It might be amenable to direct conversion, thus eliminating the need for complicated sequential processes involving steam or other phase-change materials. Its efficiency could well outstrip all other generation processes.

With post-war euphoria, we embarked on a project aimed at taming the H-Bomb – Project Sherwood. Project Sherwood involved top talent. It was financed by the Atomic Energy Commission and involved six major laboratories. It was also highly classified and had some other aspects of a crash project.

It was not too long before the researchers found that their effort was rooted in pretty mushy ground, that they understood very little about the problem and its complexities. The problem then was basically the same as it is now: How to contain a cloud of ionized or electrically-charged gas called a plasma at temperatures measured in the millions of degrees and at densities sufficient to sustain the reaction. Today the problem — and the scientists — have matured a little. We know much more about plasmas and how they react and, with the aid of the tokamak principle, have what appears to be a pretty good leg up on how to contain the plasma long enough to extract some of its energy.

In 1951 when the project started we were at a very modest funding level. By 1960, that support had multiplied a thousand times to 33 million dollars a year.

It quickly became apparent that our enthusiasm had outrun our basic knowledge. We were spending 33 million dollars a year on what was essentially an open-ended project with no immediate achievable goal and none in sight. Between 1960 and 1964 as the project ran into disillusionment, funding dropped to 22 million dollars a year. Though the actual dollar amount has been rising slowly since, in terms of constant dollars which take inflation into account, the fusion program is now being funded at about the same level as in 1964. Fusion is no longer a crash program, but thanks to the researchers who kept pressing on and the growing expansion of international scientific cooperation, the problems now appear far more soluble and — hopefully — the work of a new generation of containment specialists here and elsewhere will put the goal within reach.

But, it has taken 25 years and several false starts. So, in this case, an attractive goal and over-optimism carried us along to an over-commitment. To salvage the situation, we had to return to fundamentals.

Discovery Cannot Be Scheduled

There are many similar examples. To those of us intimately acquainted with the R&D process, it is clear that discovery and invention cannot be scheduled and that they can only be bought to a limited degree. On the other hand, new products can be created from new technologies on demand, though the process of innovation itself involves much more than merely that conversion. So we tend to believe that development can be scheduled and harnessed directly to the goals of society, but research cannot.

Actually, the situation is not that simple. Inevitably, when we schedule a new development we find that more knowledge and technique than are at hand are required. So, development stimulates new research. This feedback effect has been a major contributor to the shape of modern science, perhaps in chemistry more than in any other field.

Now, let me just summarize what I have said so far: The point is that society is beginning to insist that we as scientists and engineers do not as we want to do, nor what we can do, but what society wants us to do. The implications of this are rather startling. It is all too little understood by the public that the laws of nature provide fundamental constraints on what can be done and that the state of the art at a given time provides another, though less absolute limitation.

The danger is that the attractiveness of goals will be the determinants of new programs without sufficient attention to the adequacy or the excellence of the underlying science and engineering. So, perhaps the major issue I see on the national level is the problem of how to reconcile society's demands with the states of science and engineering and their ways of operating in the real world.

Study of Advanced Technological Possibilities

With all this in mind, let me describe briefly an on-going effort to do some forward planning for new technological – as opposed to scientific – directions. It is a major study which has been prompted by several factors. Among them are (1) unemployment among scientists and engineers; (2) the nation's trade balance, and (3) a slower growth in productivity than desired. In addition, of course, there are numerous other problems confronting the country which are susceptible to an attack by science and technology. This search for new possibilities is turning up a variety of new potentialities. Let me just mention one which appeals to me personally.

It appears that weather modification is coming of age. Results from recent federal efforts indicate that weather modification techniques can cut hurricane damage, reduce the toll from lightning and hail, and can increase water supplies through augmentation of rain and snowfall. We are not yet at a stage where any of this can be considered operational, but with a resolute effort backed by first-rate science, weather modification appears to be an important prospect for our future.

Another one is on the transportation front. There are a number of opportunities in the critical areas of personal urban transportation, interurban transit and increased productivity in freight. Technologies here involve scheduling and traffic handling systems and new vehicles in some cases. The technologies are not entirely in hand but can be confidently undertaken.

Still another important area is that of educational augmentation through use of computers and communication techniques. Here the technology is available, but we understand much less about how to use the technology to accomplish worthwhile educational goals. Again, an imaginative effort is required.

These are only a few of the possibilities and they project an

exciting future. All, however, depend upon bringing together a coalition of federal and private resources to animate the science and technology which are necessary.

New Federal Role

No matter how this new study of advanced technological possibilities turns out – and I hasten to add that it is just a study at this point – the federal government's role in the support of science and technology is going to change anyhow. The federal role has traditionally been one of support for basic science and that particular development work which was required for those products which were to be consumed by federal authorities – weapons systems, for example, and space hardware. In other words, the government supported only those things which were for its own use on the development level. Of course, there was a certain spin-off for the civilian sector.

An exception to this has been the AEC's support of the civilian power reactor program. This was support of a special kind since it was authorized specifically in the Atomic Energy Act. But generally, the federal government has left civilian product development to industry and entrepreneurs. This classical pattern of support is not adequate, in my opinion, to meet the challenges of the 70s. If the President's picture of the 1970s and 1980s is correct, we will see a peaceful world which is highly competitive economically. The outlines of this world are already beginning to emerge. The basic trend is clear.

The federal government will be influencing science and technology on a much broader front than before and from the goal-oriented end, not from the customary input side. The question we all face is: Can we do this in a balanced way so that the integrity of the fundamental work is not violated?

I believe we can! There are several reasons for this belief, but a basic one is that not only does technology feed on science but science is often invigorated by healthy technology. It's a two-way street. The coupling between these two is closer than many of us have been willing to admit in the past. In fact, I would go so far as to say that this coupling even carries an element of self-correction. Failures in technology often encourage fundamental science – though it's a hard way to learn. I believe that if a nation wants to advance in technology, it will have to turn to solid basic work. Indeed, I do not picture science and technology as being all that distinct and a prime example of their interdependence was the early fusion effort called Project Sherwood.

Basic/Applied Distinction Vague

As you all know, there have been many definitions of basic research, but what is basic and what is applied depends upon one's

vantage point. Work done over the years in universities or in some industries is considered basic in the sense that it contributed new knowledge or a new technique and the thrust of the work was not dictated by higher authority. From the vantage point of the sponsor, however, the same work was considered applied in that it was part of the larger program intended to bring forth new opportunities in a particular field or endeavor.

More to my point here tonight, however, the entire technical enterprise can be thought of as a two-dimensional structure. Along one dimension are the disciplines of science (physics, chemistry, biology, and so forth). Along the second dimension are the problems to be solved. The matrix so formed indicates that each discipline contributes to the solution of many problems and each problem involves many disciplines. The funding of R&D must take this into account if it is to be successful and I believe that new and expanded federal programs will take this into account. I feel a real sensitivity to these relationships within the government.

In closing, let me return to my initial remarks about the consumer revolt in science and technology. Vannevar Bush's monograph, "Science, The Endless Frontier", spanned both dimensions of the discipline-problem matrix. Although he is often identified with only the disciplinary research axis, it turns out that he was a visionary with a clear grasp of both axes. Like Bush, perhaps we should look along both axes of the matrix if we are to confront the consumer revolt.

Indeed, I believe that symbolically we are seeing a new monograph in the spirit of Bush's Endless Frontier being written. While it does not yet exist in manuscript form, its outlines are becoming clear. It points to a congruence between science and national goals. The title of that monograph, once it takes form, ought to be: "The integrity of purpose."

Israel - Egypt Science Gap

Last summer, Dan Greenberg, publisher of **Science and Government Report** *[see* **SPR** *4 (3):1043], took time out during the seasonal lull in Federal science-policy activities in Washington to tour research facilities in the Middle East.*

With his usual candor and knack for looking past the surface at the broad implications of what he sees and hears, he presented his observations in the form of a treatise comparing Israel's and Egypt's abilities to utilize science and technology for national purposes. This was published in the October 3 **Washington Post,** *and* **SPR** *has been given permission to reprint it here.*

MIDEAST SCIENCE GAP WIDENING

by **Daniel S. Greenberg**

Military buildups and, lately, occasional clashes dominate news of the Middle East. But something subtle is also going on there that, over the long run, is likely to be of profoundly greater importance than a few more Phantoms or SAMs or another exchange of fire: the widening of the already broad gap between Israel's and Egypt's abilities to produce, borrow and employ science and technology for national purposes.

At issue is not simply industrialization, which, after all, can be imported, as is being done in Egypt in the form of steel and hydroelectric plants provided by the Soviet Union. Rather, the difference hinges on the extent to which scientific and technical skills are woven through the general population and applied to all manner of things — from highly mechanized, science-based agriculture to computerized surveillance of potential terrorist activity to domestic production of sophisticated weaponry.

In Israel, forced-draft development of science and technology is a centerpiece of government policy and practice. In Egypt, the right words are uttered, most notably by President Sadat himself, who has repeatedly stressed the role that science and engineering must play in the development of the country. But with per capita income one-tenth that of Israel, an illiteracy rate of approximately 60 per cent, and a runaway population growth, Egypt is mired in difficulties that leave little opportunity for the nourishment of modern science.

Several years ago, Derek J. de Solla Price, professor of history of science and medicine at Yale University, concluded that "Israel has rather more scientists than the whole of Latin America and many more than the whole of Africa." If anything, the gap has probably further widened, for, while the "brain drain" from the developing countries, including Egypt, persists, Israel has actually evolved into a net importer of scientists and engineers.

A Source of Conflict

Events on this front lack drama, outside of the occasional and usually exaggerated "breakthrough" story. But at, or close to the heart of the Middle East conflict is the Arabs' anxiety about the ultimate influence and power of a Westernized, highly technological and vigorous society thriving in the heart of a generally backward region. And though official Israelis, apparently in good faith, routinely proclaim that peace and secure borders are all they desire, the history of dynamic outposts is no source of solace for the Egyptians, who, though some 35 million in number, find themselves decisively thwarted by 2.7 million Israelis. Israeli technocrats generously hold forth the prospect of their country eventually serving as a benign "technological powerhouse" for a peaceful Middle East; Arab nationalists regard the prospect as no less a threat or humiliation than Israeli occupation of Arab territories.

A tour of research institutions in the two countries quickly conveys some basic essentials of their relative standings in science and technology. In Israel, research is booming in direct consequence of the government recognizing that the laboratory is as important as the armed forces in assuring national security. In Egypt, science and technology appear to be stagnant, except for occasional pockets of productivity.

Fewer than 200 miles lie between Tel Aviv and Cairo, but the former has painstakingly situated itself in the mainstream of Western science, while in the nearby Arab capital, the existing research centers are largely isolated from Western science and many of them are struggling simply to remain in existence.

Egyptian laboratories, their budgets cut to bare essentials because of the war-burdened economy, are unable to absorb the trained manpower that annually streams from the vast expansion of higher education wrought by Nasser. Ironically, thousands of

Egyptian scientists, engineers, and physicians find themselves forced to emigrate if they wish to follow their professions. Employment – at $40 a month – is guaranteed all university graduates, but there is no guarantee that it will be in work related to their training, and often it is not.

In Israel, the manpower situation is the reverse. Bent on expanding their already thriving research activities, the Israelis are literally searching the world for additional scientific and engineering talent, and, in fact, to raise the country's already lofty peak of expertise, the government recently established a $1.5 million fund – jokingly referred to as the "Nobel fund" – to lure 10 senior scientists of international renown to take up permanent residence in Israel. Israeli recruiters regularly tour the depressed American aerospace industry to pick up specialized skills for Israel's budding aircraft industry. Under the Law of Return, all Jews are equal when it comes to settling in Israel, but, as recent protests by the so-called Israeli Black Panthers have indicated, a Soviet physicist is likely to find a warmer welcome, not to mention better housing and assured employment, than is a North African farmhand.

Over the past decade, scientific research budgets in Israel have risen an average of 26 per cent a year, to a total of about $150 million, which is said to equal the purchasing power of $300 million spent in the United States. About half of this is reliably reported to go to Israel's carefully screened off, highly capable defense research establishment. The total sum is peanuts by American standards, but the Israelis are not aiming for eminence across the board. Rather, they are carefully calling their shots. In defense research, for example, where the United States has a policy of researching almost all things possible, the Israelis, according to a top Israeli defense research administrator, first look to see whether they can buy rather than build. "We're eager to find reasons why we shouldn't do research," he explained.

Reliable research figures for Egypt are impossible to obtain, but at that country's leading scientific establishment, the multidisciplinary National Research Center in Cairo, I was told that the present budget is about half the 1967 figure – and that was considered none too generous. The Center, with a staff of 400 Ph.D.s, is so strapped for funds that it has had to terminate a program under which doctoral candidates from the University of Cairo performed their research in its laboratories. The Center has also had to pare its library acquisitions program to the main journal for each discipline, dropping the many sub-specialty journals that are essential for any research organization, especially for those remote from the leading research centers of the world. By contrast, few of the world's significant research journals are not to be had in Israel's scientific libraries.

Contact vs. Isolation

Deeply embedded in the operation of modern science is the practice of scientists making prolonged visits to distant colleagues for collaboration and exchange of experience. The traffic to and from Israeli laboratories is thick and steady. An American biologist remarked that on his periodic visits to the Weizmann Institute he is more likely to encounter certain of his favorite American colleagues than he is in the United States. (The Weizmann, incidentally, is headed by expatriate American Albert Sabin, of polio vaccine fame, who assumed its presidency two years ago.)

In Egypt's research centers, funds for travel to the West have virtually disappeared and contact with the West is at a minimum, for reasons of politics and austerity. Nevertheless, foreigners acquainted with the Egyptian scientific community, while deploring its penury and lack of organization, vouch for its inherent quality and potential.

One of the few Americans now associated with the University of Cairo remarked that "the best students stand up to any international standard." The difficulty, he added, is that a near-doubling of enrollments over the past decade took place without any commensurate increase in faculty or facilities. "The place is swamped and there just aren't the facilities or staff for training modern scientists." Despite this, he pointed out, Egyptian university graduates, particularly in medicine, pharmacology and engineering, perform extremely well when given the necessary resources, which, unfortunately, turns out to be mainly when they move abroad.

Egyptian scientists work side by side with a U.S. Navy medical research unit based in Egypt to study diseases of the region, and are highly valued as essential members of the research team. Under a policy introduced by Nasser, the country has achieved near-self-sufficiency in the production of pharmaceuticals.

Particularly celebrated researchers — and Egypt has a goodly number of international reputation — are sought after as consultants by foreign firms, and, therefore, are among the very few Egyptian scientists who can obtain the funds to travel abroad. But below the top rank, travel westward is virtually impossible. Scientific relations with the Soviet Union and the Eastern bloc countries are sprouting a bit. However, while many educated Egyptians speak English, few speak the Slavic tongues; in addition, the Egyptian scientific community shares in the apparently widespread national feeling of coolness toward the Soviet ally.

Meanwhile, Israel assiduously cultivates foreign scientific contacts. Researchers past the apprentice stage are assured funds for periodic travel abroad, usually one trip a year. It is preferred that foreigners come on their own money, but funds are available to bring in the stars of science. And, for the purpose of making friends and influencing the right people, the Israelis play the honorary degree game as well as any fund-hungry American university. Last July, for

example, Hebrew University of Jerusalem bestowed one upon the president of the U.S. National Academy of Sciences, Philip H. Handler.

Israel is a member of the recently organized European Molecular Biology Organization, which was formed to help Europe overcome the American lead in this key field of research. It has applied for membership in the European Center for Nuclear Research, one of the world's great centers for high-energy physics research; the French have frowned on formal membership, but the brotherhood of science is strong and Israelis, as individuals, are regularly in residence there to perform research.

Foreign Funding

Since the Israeli economy as a whole operates at a huge deficit, it is difficult to understand how the country can afford its great splurge on science. Part of the answer is that the U.S. government has provided a good deal of money for basic research — currently about $8 million a year in surplus currencies from sales of U.S. agricultural products. In addition, science, particularly when it is related to medicine, appeals to the traditionally strong Jewish instinct for philanthropy, and there is scarcely a Bunsen burner in Israel that does not bear the name of a Jewish-American benefactor.

The American role in financing science is declining as the store of American-held Israeli funds rapidly decreases, but West German organizations are stepping in to provide assistance. The Volkswagen Foundation, West Germany's version of the Ford Foundation, is currently providing the Weizmann Institute with $1.2 million a year, which is roughly 10 per cent of the Institute's budget. VW also gives money to other Israeli research and academic institutions.

The Germans do not ignore the Egyptians; they are providing them with a small institute for research on Bilharzia, the snail-boring parasitic disease that is a major public health problem in rural regions. But the scale of assistance to Egypt is minuscule in comparison with aid to Israel.

The Israelis shrewdly observe that German aid is far more closely linked to Germany's own scientific aspirations than is American aid. One Israeli noted that the Germans, who are also on a science-building splurge, tend to put their money into collaborative efforts in areas in which they are weak and Israel is strong.

While U.S. foreign aid programs have always included a generous slice for the development of educational and technical resources, Soviet aid to Egypt by all accounts is concentrated on military hardware and heavy industry. The leading exception is a fairly large atomic research center; but in East-West nuclear politics, more than charity is involved when a superpower seeks to tie another nation to its nuclear equipment, supplies and techniques. Fellowships for training in the Soviet Union, as well as some research equipment, are increasingly in evidence in Egypt, but the volume is extremely small.

Uneven Development

At the moment, one of the paradoxes of Israeli science is that it has produced relatively little direct economic benefit for the country, outside of the great impact it has had on Israeli agriculture. The cause of this is simple enough: Israel is extraordinarily uneven in its economic development.

The Zionist stress on science, the influx of European academic scientists before and after World War II, and the availability of American philanthropy virtually guaranteed the swift development of science in an otherwise barren country. Lacking natural resources, and imbued with the back-to-the-earth ideology, little effort was put into the development of industry, but agriculture and science early formed an alliance. The result is that Israel is a world leader in agricultural efficiency, routinely serving the markets of Europe with genetically tailored, air-delivered produce, fruits and flowers.

Industry, however, is a late bloomer in Israel. Recognizing that the country is in the unusual, perhaps unique, situation of advanced science having preceded basic industry, the government is encouraging efforts to divert civilian research away from its basic science orientation toward the development of salable products. Subsidized industrial "research parks" have sprung up adjacent to most of the country's major academic research centers. Hebrew University, long a bastion of basic research, recently opened a school of applied science and technology. The government now pays for half of almost any research performed by an industrial organization.

And, in response to the lack of the sort of home market that backstops Japan's fantastic success with high-technology export products, Israel is successfully experimenting with a new form of international collaboration: University researchers are being encouraged to form small companies for the development of science-based products. These companies, in turn, are encouraged to develop ties with large American companies that possess international marketing organizations. One of these research organizations, attached to Hebrew University, has developed an inexpensive and simple thyroid test kit. Manufacturing takes place in Israel, where labor costs are relatively cheap. Marketing is in the hands of the Ames Division of Miles Laboratories, in Indiana. Current sales are reported at one million kits per year.

Egypt, too, is seeking to extract greater industrial benefit from its scientific resources. But the poverty of the country, the general demoralization of the scientific community, and heavy industry's traditional indifference toward research make the task a difficult one. At Cairo's National Research Center, staff members are encouraged to seek consulting ties with industry. "We're willing," one staff member explained, "and we've had some success, but industry is far from enthusiastic."

While the economic implications of skill in science and tech-

nology are great, the political implications are probably even greater. In its dealings with its hostile neighbors, Israel has always encountered restraints in the attitudes of the nations upon which it has had to depend for advanced weaponry – principally the United States. Tiny as it is, it will, of course, never be free of the need for foreign good will and assistance. But in the military field, a key objective of Israeli research and development policy is eventual self-sufficiency in weapons essential to survival.

"Our resources are limited," a Defense Ministry official observed, "but, while we can't do everything, we are at the point that we can do anything in military research that any of the powers below the United States and the Soviet Union can do."

The Israelis have already produced a highly reliable missile of 300-mile range. And they are reported to be hard at work on home production of the high-performance military aircraft for which they must now haggle with the United States. There is no firm evidence that they have constructed a nuclear bomb, and they deny that they have done so. But there is no doubt that they possess the talent and fissionable materials that go into bomb making.

Burdened by vast military costs, inflation, lagging industrial development, and recently, outcroppings of domestic strife between Jews of African and European origin, the Israelis scoff at the notion that they are swiftly en route to becoming a scientific superstate.

From the tattered laboratories of Egypt, however, the view is quite different.

Current Literature

ALASKA PIPELINE

1352. Mines, S., "Alaska's Black Gold", *Ecology Today*, v. 1, no. 9, November 1971, pp. 17-18, 47-48.

Presents views of those for and against the trans-Alaska pipeline; cites charges by oil companies and conservationists and questions the thoroughness of the environmental impact statement; presents two more-economical alternatives; notes the American Petroleum Institute's launching of a large advertising campaign and Panarctic Oils Ltd.'s raising vast sums for oil exploration in the Canadian Arctic.

1353. Aspin, L., "Canadian Pipeline Alternative Should be Studied", *Congressional Record*, v. 117, no. 137, 21 September 1971, pp. E9832-9838.

Rep. Aspin discusses and reprints a June 1970 report which concludes that a pipeline to Chicago could be constructed for less and operated for the same or less than the trans-Alaska line and its tanker system; urges consideration of the Canadian route before granting any construction permits.

1354. Begich, N., "The Trans-Alaska Pipeline: Concerns of the Cordova District Fisheries Union", *Congressional Record*, v. 117, no. 172, 12 November 1971, pp. E12189-12191.

Rep. Begich presents a fact sheet prepared by the Cordova District Fisheries Union of Alaska describing the wildlife around Prince William Sound and expressing the fear of the fishermen that a pipeline and supertanker transfer facility at Valdez will harm this wildlife; recommends in-depth studies to resolve the questions, and calls for consideration of the trans-Canada pipeline.

ASIA

1355. Farvar, M. T., et al., "The Pollution of Asia", *Environment*, v. 13, no. 8, October 1971, pp. 10-17.

Reviews some of the discussions held at the Conference on Asian Environments which "served to bring together for the first time a diverse group of young scholars from [over 16 Asian] developing countries interested in environmental problems"; describes the successes and problems created in the process of development.

1356. "ASCA Becomes a Reality", *Philippine Science Review*, v. 12, no. 1, January-February 1971, pp. 4-5.

Reproduces the Joint Communique issued by the Association for Science Cooperation in Asia (ASCA), formally organized at a 5-day organizational meeting in November 1970 of the Proposed Association of Ministers of Science in Asia, by delegates from Australia, Chinese Republic, Japan, Korean Republic, Philippines, Singapore, and Thailand; ASCA's purpose is to pool the Member nations' skills and resources in science and technology to solve their common problems.

ATMOSPHERIC SCIENCES

1357. *The Atmospheric Sciences and Man's Needs: Priorities for the Future*, Committee on Atmospheric Sciences, National Research Council, 1971, 88 pp. (Available from Printing and Publishing Office, National Academy of Sciences, 2101 Constitution Ave., N.W., Washington, D.C. 20418. Price: $3.25.)

Identifies applications of the atmospheric sciences that can contribute most to human needs within the next 5 to 10 years and suggests, in order of priority, broad outlines of programs to meet these needs; discusses weather prediction, air quality, weather and climate modification, weather dangers and disasters, and funding needed for facilities and operations through 1979; 71 references.

1358. *The Study of Man's Impact on Climate: The Summary Report* (Available from *Technology Review*, E19-430, M.I.T., Cambridge, Mass. 02139. Price: 48¢ in stamps or 50¢ cash.)

Presents specific recommendations for programs that will provide knowledge in six areas: previous climate changes, man's activities that may affect climate, present theory and models of climate change, modification of the lower atmosphere, climatic effects of man-made surface change, and modification of the stratosphere.

1359. Dominick, P. H., "Weather Modification", *Congressional Record*, v. 117, no. 174, 15 November 1971, pp. S18544-18546.

Sen. Dominick reprints excerpts from "A Call for Action" by V. J. Schaefer in the 1970 *Journal of Weather Modification*, reviewing some of the problems delaying realization of potential benefits; critizes the statistical analysis methods used and suggests the formulation of a long-range program to apply existing technology to beneficial use — particularly for augmenting water supplies through weather modification.

1360. *Plan for U.S. Participation in the GARP Atlantic Tropical Experiment*, Report of the Ad Hoc Tropical Task Group, 1971, 25 pp. (Available from U.S. Committee for the Global Atmospheric Research Program, 2101 Constitution Ave., N.W., Washington, D.C. 20418.)

Describes the GARP Tropical Sub-programme to study aspects of tropical meteorology deemed essential to develop adequate numerical models of the large-scale atmospheric circulation; outlines the scientific objectives, observational strategy, data acquisition and processing plans, and management considerations.

1361. *Plan for U.S. Data Management in the Global Atmospheric Research Program*, Report of the GARP Data Management Panel, 1971, 14 pp. (Available from the U.S. Committee for the Global Atmospheric Research Program, 2101 Constitution Ave., N.W., Washington, D.C. 20418.)

Points up the need for early data system planning on an integrated basis for the GARP Tropical Atlantic Experiment planned for the summer of 1974 and for the First GARP Global Experiment, scheduled for 1976; makes specific recommendations regarding the data-collection aspects of the two experiments.

1362. *First Five Years of the Environmental Satellite Program — An Assessment*, A Report to the Administrator of the National Oceanic and Atmospheric Administration, U.S. Department of Commerce, February 1971, 30 pp. (Available from National Oceanic and Atmospheric Administration, National Environmental Satellite Service, Meteorological Satellite Laboratory — S31, 3737 Branch Ave., S.E., Suite 300, Washington, D.C. 20031.)

Describes the direct benefits (in economy, protection of life and property, and public activities) being provided by weather satellites in such applications as weather analysis and forecasting and environmental services, including maritime activities, hydrology, space-disturbance monitoring, and others.

AUSTRIA

1363. "Austria: 1971 Government Report on Research", *Science Policy News*, v. 3, no. 2, September 1971, pp. 23-24.

Presents highlights of 1971 report to Parliament, containing a critical analysis of Austrian R&D and recommending that research policy be integrated with social and economic policy, be flexible, and make efficient use of the various Government Departments; discusses steps to increase the volume and efficacy of R&D, with expenditures (targeted at 1.5 to 2% of the GNP) borne equally by the public and private sectors.

BIBLIOGRAPHIES

1364. Moore, J. A., *Science for Society: A Bibliography*, Second Edition, prepared for the Commission on Science Education, American Association for the Advancement of Science, 1971, 76 pp. (Available from Education Department, AAAS, 1515 Massachusetts Ave., Washington, D.C. 20005. Price: $1.00, or 75 cents each in multiples of 10 copies.)

Lists about 4000 references, some briefly annotated, to literature dealing with all aspects of the interrelationships of man, society, environment, science, and technology; entries are classified and indexed by content in 5 major categories (general; resources; science, technology, society; population; and health), and further subdivided in minor categories; a subject index tells where to look for some 160 topics from ABM to Youth culture.

1365. Voress, H. E. (Comp.), "Science and Society: A Bibliography", USAEC Report No. WASH-1182, July 1971, 21 pp. (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price: 35 cents.)

Lists 410 references, alphabetically by senior author, to literature published from 1968 through March 1971; includes a separate author index.

1366. *Index to Literature on Science of Science*, Research Survey and Planning Organization, CSIR, v. 7, nos. 1 and 2, January and February 1971, 22 pp. (Available from the Research Survey and Planning Organization, CSIR, Rafi Marg, New Delhi-1, India.)

Contains 106 annotated references to science policy literature published during January through April 1970 in 20 Indian journals; listed under 16 different headings, including agriculture, economic development, education, expenditure, industry, management, manpower, planning, policy, and society.

1367. *Index to Literature on Science of Science*, Research Survey & Planning Organization, CSIR, v. 7, nos. 3 and 4, March and April 1971, 33 pp. (Available from the Research Survey & Planning Organization, CSIR, Rafi Marg, New Delhi-1, India.)

Contains 152 references to science policy literature published during the spring and summer of 1970 in 21 journals (mostly U.S. and British), listed under approximately the same headings as listed in Ref. 1366.

1368. Weiss, J. H., *Technology and Social History*, Research Review no. 8, Harvard University Program on Technology and Society, 1971, 93 pp. (Available from Harvard University Press, 79 Garden St., Cambridge, Mass. 02138. Price: $2.00.)

Presents a brief essay summarizing literature on the historical relationship between technological and social change, mainly from English-language works depicting the history of Western Europe and the U.S. before 1945; reviews 57 books and articles in 4 categories: General, Technology and Economic Growth, Agencies of Diffusion and Resistance, and Studies of the Role of Single Technologies; gives a summary statement at the beginning of each subcategory.

1369. Kiraldi, L., and Burk, J. L. (Comps.), *Pollution: A Selected Bibliography of U.S. Government Publications on Air, Water, and Land Pollution, 1965-1970*, April 1971, 78 pp. (Available from Western Michigan University, Institute of Public Affairs, Kalamazoo, Michigan 49001. Price: $3.00.)

Lists reference books with brief annotations and general publications without annotation, in 3 sections: Land Pollution, Air Pollution, and Water Pollution; in each section, the reference books are further subdivided into abstracts, bibliographies, directories, guides and handbooks, and laws and regulations; similarly, the general materials are listed according to issuing agency; contains about 800 references, each identified by Superintendent of Documents call number, but with no price or ordering information.

1370. **Saylor, J. P., "Review of Literature on the Environment", *Congressional Record*, v. 117, no. 141, 27 September 1971, pp. H8738-8743.**

Reprints two *Library Journal* articles by G. Siehl, reviewing about 60 carefully selected pieces of environmental literature and noting that the 1970-71 environmental literature "is almost as voluminous as all that went before".

BIOLOGICAL SCIENCES

1371. **Weinberg, A. M., "Technology and the Life Sciences", *BioScience*, v. 21, no. 21, 1 November 1971, pp. 1085-1087, 1095.**

Describes the contributions of energy technology to the life sciences and practice of medicine through radioisotopes (that is, their use in biomedical research and in medical diagnosis and therapy), the potential for entropic technology in the same areas, and the demands placed on life sciences by adverse side effects of technology.

1372. **Heckler, M. M., "The Cause of Biomedical Research", *Congressional Record*, v. 117, no. 143, 29 September 1971, pp. E10270-10271.**

Reviews the research programs initiated by the National Institutes of Health and endorses the 14 recommendations of the Association of American Medical Colleges regarding biomedical research policy; stresses the need for government support of biomedical research.

1373. **Bronzino, J. D., "The Biomedical Engineer – The Roles He Can Play", *Science*, v. 174, no. 4013, 3 December 1971, pp. 1001-1003.**

Defines biomedical engineering as the application of the theory and techniques of engineering to enable life scientists to explore physiological mechanisms and to assist physicians in effective and efficient health care; describes 3 types of biomedical engineer: the problem solver, the technological entrepreneur, and the engineer-scientist.

1374. **Kass, R., "The New Biology: What Price Relieving Man's Estate?", *Science*, v. 174, no. 4011, 19 November 1971, pp. 779-788.**

Describes the major purposes of biomedical technology, the basic ethical and social problems posed by its use; warns of the disastrous consequences of failure to recognize the need for both national and international control; stresses the need for caution and education of the public and scientists in relationships between science/technology and ethics/politics.

1375. **Peter, W. G., III, "Ethical Perspectives in the Use of Genetic Knowledge", *BioScience*, v. 21, no. 22, 15 November 1971, pp. 1133-1137.**

Discusses opinions presented at a 4-day conference in Washington, D.C., attended by 80 internationally renowned scholars; discusses the use of genetic knowledge and the concrete physiological and abstract meanings of "life", and presents a list of priorities in the use of scientific genetic knowledge.

1376. **"Bioethics Center Formed", *Chemical & Engineering News*, v. 49, no. 42, 11 October 1971, p. 7.**

Cites some ethical questions occasioned by recent developments in such areas as human reproduction, genetic engineering, and organ transplants; describes the disciplines represented at the Joseph and Rose Kennedy Institute for the Study of Human Reproduction and Bioethics, namely, all aspects of human reproduction, social science, and ethics.

1377. *The United States-Japan Cooperative Medical Science Program, Five Year Report, 1965-1970*, U.S. Department of State Publication 8598, July 1971, 148 pp. (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price: $2.00.)

Describes progress made through research in immunization against and control and treatment of cholera, leprosy, tuberculosis, and parasitic and viral diseases, as well as studies being conducted which are leading to prevention of malnutrition in Asia; presents future goals of research in these areas.

BUDGET FOR SCIENCE AND TECHNOLOGY

1378. Fisher, W. H., *Probable Levels of R&D Expenditures in 1972: Forecast and Analysis*, December 1971, 9 pp. (Available from Public Services Office, Battelle-Columbus, Columbus, Ohio 43201.)

Predicts that industrial and Federal spending for R&D will total a record $30.1 billion in 1972, with antiscience attitudes diminishing, and growing sentiment for the use of R&D as a tool for social and environmental improvement; cautions against overoptimism, because of possible slippages in the appropriations-spending process and because increases in the cost of performing R&D since 1969 will not be fully offset by increased expenditures.

1379. *An Analysis of Federal R&D Funding by Budget Function, 1960-1972*, Surveys of Science Resources Series, National Science Foundation Report NSF 71-25, July 1971, 93 pp. (Available from Division of Science Resources Studies, NSF, Washington, D.C. 20550.)

Reflects the allocation of priorities within the Federal Government by comparing Federal R&D expenditures in 1960-72 by budget function (national defense, natural resources, health, commerce and transportation, education and manpower, space research and technology, etc.) with total Federal outlays for each function; analyzes trends and developments and describes current R&D programs.

1380. "Industrial R&D Spending, 1970", *Science Resources Studies Highlights*, NSF 71-39, 10 December 1971, 4 pp. (Available from National Science Foundation, Washington, D.C. 20550.)

Presents statistics showing that R&D spending by industry in 1970 was more than double that in 1958 but 3% below that in 1969, with the entire drop accounted for by reduced Federal spending in industry (lowest since 1965); company R&D funds in 1970 increased to a 16-year record 56% of industrial R&D spending, while the January 1971 employment of R&D scientists and engineers (360,000) was 6% below that in January 1970;

presents breakdowns by industry and activity.

1381. "NSF Allocations for Science, Scientific Research, and Education in the Sciences, FY 1972", *SPPSG Newsletter*, v. 2, no. 9, November 1971, pp. 12-14.

Tabulates allocations of the $622 million National Science Foundation appropriation for FY 1972 among the various activities; of the $242.25 million designated for basic research, 90% is expected to go to colleges and universities; another $86.1 million is earmarked for science education support, while RANN is budgeted at $54.1 million.

CANADA

1382. Grosart, A., "Canadian Science Policy", *Minerva*, v. 9, no. 4, October 1971, pp. 538-544.

Presents an abridged version of Canadian Sen. Grosart's paper before the Canadian Economics Association last June, calling attention to the fact that major science policy decisions are in the hands of the politicians and reviewing the shortcomings of Canada's national science policy as presented in Vol. I of the Senate Committee's report [SPR 4(1): 27]; discusses the structure of political science decision making, the need for a national science budget, and the appointment of a minister of national science policy to coordinate the nation's science activities.

1383. Solandt, O. M., "Science Policy and Canadian Manufacturing Industries", *Nature*, v. 234, no. 5326, 26 November 1971, pp. 183-185.

Examines the factors which determine the amount of R&D undertaken in Canadian industry and suggests that the influence of multinational corporations must be carefully incorporated in future science policy for Canada.

1384. Calamai, P., "Building a New Bureaucratic Behemoth: Environment Canada", *Science Forum*, v. 4, no. 5, October 1971, pp. 10-12.

Describes the problems inherent in establishing an overall science policy in a structure the size of Environment Canada (first named the Department of the Environment and Renewable Resources); discusses the major tasks facing the new department, including reeducating its own employees away from the resources-exploiting attitude of Fisheries and Forestry.

1385. Beaulnes, A., "Canada's New Ministry of State for Science and Technology", *Science Forum*, v. 4, no. 6, December 1971, pp. 16-18.

Beaulnes, Secretary of the new Ministry (effectively Canada's senior Federal science adviser), describes the functions of the new Minister, including (1) formulating local and global science and technology policy, (2) providing advice to the Treasury Board in assessing programs and analyzing science and technology expenditures, (3) recommending organizational and operational changes to government agencies, universities, and industry, and (4) developing and implementing small operational units (forecasting, information and analysis, and industrial strategy).

1386. Krenz, F. H., "Technological Awareness: Lessons Learned from the Nuclear Power Industry", *Science Forum*, v. 4, no. 6, December 1971, pp. 26-29.

Recommends a partnership between Canadian industry and the university to provide advanced specialization of any rapidly developing technological industry, with industry providing the manpower and financing and the university providing sound fundamental education and laboratory facilities; Government's role would be to encourage industry participation by tax concessions and grants, while continuing traditional support of universities.

1387. Bennett, W. D., "Matching Research Manpower to Society's Needs", *Science Forum*, v. 4, no. 6, December 1971, pp. 21-22.

Points out that while the per capita expenditures on R&D by Government and by universities in Canada are about the same as those in the U.S. ($16 to $20), expenditures by U.S. industry are about 5 times as large as Canada's on a per capita basis; offers this as one reason for Canada's inability to absorb its output of specialized research graduates, and makes some recommendations for solving the problem.

1388. Kushner, J., and Masse, I., "Special Report: Summary of Studies on Job Opportunities", *Science Forum*, v. 4, no. 5, October 1971, pp. 24-25.

Summarizes results obtained in three separate studies on the employment market facing Canadian University graduates; concludes that present graduates, including those in science and engineering, will generally "be either unemployed or underemployed in terms of traditional employment opportunities", and that "market imbalances can be corrected by government interference with supply and/or demand".

CHINA

1389. "Few Scientific Contacts", *Chemical & Engineering News*, v. 49, no. 46, 8 November 1971, p. 6.

Cites exchange of scientific data and publications as one area in which new relations will be initiated by President Nixon's visit to Mainland China; describes the complete lack of contact between U.S. and Chinese scientists since the Chinese cultural revolution" (1965-68).

1390. "C. N. Yang Discusses Physics in People's Republic of China", *Physics Today*, v. 24, no. 11, November 1971, pp. 61-64.

Discusses the work being done in nuclear and solid state physics and electronics, and the widespread interest in high- and low-energy accelerators; describes educational innovations toward achieving the Chinese goal of amalgamating teaching, research, and production, and the favorable attitude toward science fostered by Mao's belief that China should contribute to mankind, through scientific development.

1391. Ehrlich, P. R., and Holdren, J. P., "Neither Marx Nor Malthus",

Saturday Review, 6 November 1971, p. 88.

Describes China's population-control measures such as distribution of free contraceptive pills, legal abortion, birth-control propaganda, and recognition of virtual equality between men and women with the attendant responsibilities which make large families a burden.

COMMUNICATIONS

1392. **Leonard, E., et al., "MINERVA: A Participatory Technology System", *Bulletin of the Atomic Scientists*, v. 27, no. 9, November 1971, pp. 4-12.**

Describes MINERVA (Multiple Input Network for Evaluating Reactions, Votes, and Attitudes), a system of social communication developed by the Center for Policy Research, whereby large groups of citizens dispersed across the country can respond regularly to social economic, and political situations; calls for legislation that would require corporations installing CATV cables to reserve 1/3 of their cable capacity for not-for-profit institutions in the community.

DENMARK

1393. **Friedman, B., "Life, Machines and Law: An Interview with Helga Pederson", *Impact of Science on Society*, v. 21, no. 3, July-September 1971, pp. 197-214.**

A Danish Supreme Court Justice answers questions about Denmark's legal position on technology-impelled changes with regard to abortion, artificial insemination, birth control, organ transplants, computer faults, electronic snooping, and exploitation of the continental shelf.

DEVELOPING COUNTRIES

1394. **Nanes, A. S., *Beyond Malthus: The Food/People Equation*, Prepared for the Subcommittee on National Security Policy and Scientific Developments of the Committee on Foreign Affairs, U.S. House of Representatives, 1971, 96 pp. (Available from House Committee on Foreign Affairs, Room 2170 Rayburn House Office Building, Washington, D.C. 20515.)**

Analyzes the interaction of science, technology, and American diplomacy in the complex problems of the changing balance between food and population in developing countries; includes sections on (1) defining the food/population equation in developing countries, (2) meeting food requirements of developing countries, (3) the politics and diplomacy of food, (4) technology for controlling the population explosion, (5) political and diplomatic issues of the population problem in developing countries, and (6) future diplomatic issues of the food/people equation.

1395. **Heyneman, D., "Why We Must Prevent Foreign Aid from Becoming**

an Ecological Nightmare", *Science Forum*, v. 4, no. 5, October 1971, pp. 3-9.

Describes a number of "horrendous ecological pitfalls" fallen into as a result of well-meaning but ill-researched attempts by the U.S. and others to improve the lot of the Third World nations; recommends that technical aid to developing nations (which is sorely needed) be supplied "only if it is based on locally gained reliable information, ecologically compatible, socially acceptable, and politically feasible".

1396. Anderson, R. S., "Are Conferences on Science in Poor Nations a Useless Extravagence?", *Science Forum*, v. 4, no. 6, December 1971, pp. 12-15.

Laments the fact that the many international conferences of those who govern and those who study the growth of science in poor countries have had no cumulative impact; analyzes the shortcomings of such conferences, including lack of balanced representation and failure to review and act on results from preceding conferences.

1397. Long, F. A., "Cornell University", *SPPSG Newsletter*, v. 2, no. 8, October 1971, pp. 11-12.

Announces receipt of a 5-year $580,000 grant from AID for a new teaching and research program on "Policies for Science and Technology in Developing Nations", under Cornell's Center for International Studies, College of Engineering, and Program on Science, Technology, and Society; describes plans for the program.

1398. Bayh, B., "U.S. Policy Toward Africa", *Congressional Record*, v. 117, no. 147, 5 October 1971, pp. S15826-15829.

Sen. Bayh points out that transfer of Western technology to African countries has not alleviated their unemployment problems; reprints an article by J. P. Grant which discusses unemployment and overpopulation problems in developing countries and suggests that such countries could deal with these problems by removing biases favoring use of scarce capital over abundant labor, by developing labor-intensive technologies, and by developing the potential for the Green Revolution.

ECONOMICS AND SCIENCE

1399. *Science, Technology, and the Economy*, Hearings before the Subcommittee on Science, Research, and Development of the Committee on Science and Astronautics, U.S. House of Representatives, 92nd Congress, 1st Session, 27-29 July 1971, 161 pp. (Available from Committee on Science and Astronautics, U.S. House of Representatives, Rayburn Office Building, Washington, D.C. 20515.)

Presents testimony by 6 witnesses (including U.S. Secretary of Commerce Stans, U.S. Secretary of the Treasury for Economic Policy Weidenbaum, a university economist and representatives of industry and AFL-CIO) as the first step in a detailed study of Science, Technology, and the Economy, to try to ascertain what

resources the U.S. should invest in R&D and the optimum ways for investing them.

1400. *Technology and International Trade*, Proceedings of the Symposium sponsored by the National Academy of Engineering, 14-15 October 1970, 1971, 146 pp. (Available from National Academy of Engineering, 2101 Constitution Ave., N.W., Washington, D.C. 20418.)

Consists of introductory remarks, 3 papers reviewing the international trade position of U.S. industry in general, and one paper each on international trade in 4 key industries: computers, automobiles, textiles, and machine tools; leads to the conclusion that the technology gap is narrowing or has reversed — a situation that will continue to worsen without a concerted drive by U.S. Government, industry, and public to achieve technological advances and increase exports.

1401. Parr, J. G., "New Perspectives on Science Policy from the OECD", *Science Forum*, v. 4, no. 5, October 1971, pp. 13-14.

Discusses the Brooks report [see *SPR* 4(3):1234] from the Organisation for Economic Co-operation and Development which defines science policy as "policies for the natural sciences, the social sciences, and technology" and which identifies two central themes that will prevail in OECD countries in the next decade: "(1) economic growth per se is no longer a sufficient overall objective, and (2) further intervention in the working of the market economy will become necessary".

1402. Wakelin, J. H., Jr., "U.S. Leadership in High Technology Products: A U.S. View", Remarks before the American Institute of Physics Annual Meeting of Society Officers and Corporate Associates, the Rockefeller University, New York City, *U.S. Department of Commerce News*, Washington, D.C. 20230, 23 September 1971, 18 pp.

Discusses the theme that "one of the greatest educational needs in this Nation today is to develop among policy makers, leaders of the private sector, citizens, and especially among young persons, an awareness and understanding of technology and its relation to economic strength and trade"; describes trends in U.S. export-import trade in agricultural products, raw materials, and high- and low-technology products; lists criteria for technology enhancement by the Government; illustrated with charts.

1403. "Estimated Academic R&D Direct Price Trends, 50 Percent Higher Over Decade 1961-71", *Science Resources Studies Highlights*, NSF 71-32, 1 November 1971, 7 pp. (Available from National Science Foundation, Washington, D.C. 20550.)

Explains analysis of the composition of academic expenditures and of price trends relevant to R&D costs, indicating that most of the 10-year direct-cost increase of 50% was in the form of higher payments to personnel and that most of the rise occurred in the last 5 years.

1404. *Aerospace and the U.S. Economy: Its Role, Contributions and Critical Problems*, November 1971, 68 pp. (Available on request from Aerospace Research Center, Aerospace Industries Association of America, Inc., 1725 DeSales St., N.W., Washington, D.C. 20036.)

Presents an in-depth economic profile of the aerospace industry, its role in the national economy, and the critical economic problems it faces; emphasizes factors considered "essential to rational policy-making in the years immediately ahead" in a manner intended to be "diagnostic rather than prescriptive"; detailed supporting statistics are appended.

1405. Heiss, K. P., "Our R&D Economics and the Space Shuttle", *Astronautics & Aeronautics*, v. 9, no. 10, October 1971, pp. 50-62.

Shows, using the Space Shuttle System as an example, "how economic analysis should affect choice among competing R&D projects and how, in turn, a choice relates to the national economy, the available resources, and the long-term outlook of the [U.S.] nation".

1406. "Britain Confident of EEC Membership", *Chemical & Engineering News*, v. 49, no. 48, 22 November 1971, p. 16.

Discusses the conflicting British public opinion on Britain's prospective merger into the European Economic Community along with Denmark, Ireland, and Norway; describes the concern of U.S. government officials over possible affiliation of the European Free Trade Association members with EEC and the resultant creation of a powerful trading bloc.

EDUCATION

1407. Bevan, W., "Science and the Universities in the Decade Ahead", *American Scientist*, v. 59, no. 6, November/December 1971, pp. 680-685.

Describes the changes in enrollment, funding, and public attitudes that will determine the future of universities; offers possible means for the academic world to cope with future demands; advocates closing "the gap between students and teachers, between the universities and the real world, and between the reality of the 50s and 60s . . . and the new reality of the 70s and 80s".

1408. *Social Directions for Technology*, Memorandum of a Workshop Sponsored by the Commission on Education, National Academy of Engineering, June 1971, 51 pp. (Available from Commission on Education, NAE, 2101 Constitution Ave., N.W., Washington, D.C. 20418.)

Presents selected quotations and a distillation of conclusions from the July 8, 1970, NSF-supported Workshop to determine objectively how education might be refocused to make technology better serve the needs of society; Appendixes describe the mechanics of Workshop organization, identify committee and advisory people, list all participants, abstract 5 case studies, and abstract the 3 keynote talks.

1409. "Conflicting Philosophies on Higher Education", *Nature*, v. 234, no. 5324, 12 November 1971, p. 65.

Discusses the differences between the higher education bill passed by the Senate and that passed by the House of Representatives,

the chief difference being the provision for general institutional support contained in the House bill, as contrasted to the Senate's educational-opportunity grants to students, plus institutional grants on the basis of numbers of students receiving the former type grants.

1410. **Drew, D. E.,** *A Study of the NSF College Science Improvement Program,* **American Council on Education Research Reports, v. 6, no. 4, June 1971, 37 pp.** (Available from the Office of Research, American Council on Education, One Dupont Circle, Washington, D.C. 20036.)

Presents conclusions (some of which are negative) from a survey made to study the effectiveness of COSIP, under which 105 grants totalling over $18 million were made between 1966 and 1969 to "accelerate the development of the science capabilities of predominantly undergraduate institutions"; offers recommendations for future science-education research; 7 references, 2 appendixes.

1411. **"Engineering Needs for 'Postcatastrophe Age' ",** *Chemical & Engineering News,* **v. 49, no. 42, 11 October 1971, pp. 30-31.**

Presents a few of the ideas expressed at a meeting in Hanover, N.H., of Dartmouth College's Thayer School of Engineering on the course of engineering in the future; most believed that engineering will take society more and more into account.

1412. **"Educators Call for Increased Productivity",** *Chemical & Engineering News,* **v. 49, no. 43, 18 October 1971, p. 54.**

Discusses the current college financial situation (limited resources and spiraling costs) as brought out at the 54th meeting of the American Council on Education, and calls for more education for less money if there is to be an equal number of students educated from all social classes; presents some ways of achieving economies.

1413. **Zinberg, D., "The Widening Gap: Attitudes of First-Year Students and Staff Towards Chemistry, Science, Careers and Commitment",** *Science Studies,* **v. 1, nos. 3/4, October 1971, pp. 287-313.**

Describes the students' attitudes (e.g., general apathy toward science, the view that science is narrow) revealed by interview and questionnaire analysis as well as participant observation; recognizes the conflicting values between students and faculty and implies that teachers should try to alter students' apathy.

1414. **" 'Minority' Research Support",** *Washington Science Trends,* **v. 27, no. 4, 1 November 1971, p. 21.**

Announces the availability of National Science Foundation grants up to $16,000/year to faculty of 4-year degree-granting institutions which "historically have educated disadvantaged ethnic minorities", for research under the College Science Improvement Program; write Program Director, COSIP D, Division of Undergraduate Education in the Sciences, National Science Foundation, Washington, D.C. 20550.

1415. **"Enrollment Increase in Science and Mathematics in Public Secondary Schools, 1948-49 to 1969-70",** *Science Resources Studies Highlights,*

NSF 71-30, 15 October 1971, 4 pp. (Available from National Science Foundation, Washington, D.C. 20550.)

Presents a report developed from a sample survey conducted for the NSF by the Office of Education showing that the number of secondary school students enrolled in science and mathematics in 1969-70 was 2.5 times larger than that in 1948-49, while during this period the total enrollment in grades 9-12 increased only 2.3 times.

1416. "Companies Continue Educational Aid Programs", *Chemical & Engineering News*, v. 49, no. 48, 22 November 1971, pp. 22-23.

Describes efforts by industry (such as awarding of grants and scholarships to students, and teaching sabbaticals to employees) to achieve better communication with universities and also with secondary schools.

1417. Ritterbush, P. C., "Environmental Studies: The Search for an Institutional Form", *Minerva*, v. 9, no. 4, October 1971, pp. 493-509.

Traces the history of environmental education and the shortcomings of various established institutional forms (universities, government laboratories, and contract research centers) as settings for the fruitful study of human ecology; suggests that an entirely new, as yet undeveloped, institutional form may be the only one that can succeed.

1418. *Social Science Education Needs for Undergraduates in Agriculture and National Resources*, Report of the Committee on Social Sciences of the Commission on Education in Agriculture and Natural Resources, National Academy of Sciences, 1971, 26 pp. (Available from Division of Biology and Agriculture, NRC, 2101 Constitution Avenue, N.W., Washington, D.C. 20418.)

Discusses the need for more emphasis on social sciences in agricultural and natural resources curricula; states that "to prepare today's undergraduates for tomorrow's problems requires that an attempt be made to understand the factors creating the conditions for tomorrow" and "the challenge today is to deal better with increasingly difficult social problems".

1419. "State Council Promotes Environmental Literacy", *Chemical & Engineering News*, v. 49, no. 41, 4 October 1971, pp. 42-43.

Describes the plans of the New Jersey Council for Environmental Education which expects $270,000 in 1971 state funds and has just received a 3-year grant of $452,600 annually from the U.S. Office of Education for (1) developing a kindergarten-through-college program of environmental education, (2) developing teacher training programs, and (3) involving citizens in the pollution problems of New Jersey.

1420. *Oak Ridge Associated Universities, 25th Annual Report* for the year ending June 30, 1971, 51 pp. (Available from ORAU, Information and Services Dept., P.O. Box 117, Oak Ridge, Tenn. 37830.)

Reports on FY 1971 activities of ORAU, a private nonprofit corporation sponsored by 41 universities in the South (formerly Oak Ridge Institute of Nuclear Studies), funded by the USAEC; topics include university – AEC laboratory relations, education,

research, training and technology, budget and organization, staff publications, and personnel.

ENERGY CRISIS

1421. "Energy Crisis: Can Technology Help?", *Washington Science Trends*, v. 26, no. 26, 4 October 1971, pp. 153-156.

Describes some of the ideas discussed at a World Energy Conference in Washington in late September including: the availability of ample energy resources in the U.S. — at a cost; the role of nuclear energy in producing electricity in the future; and the environmental impact of producing, transporting, and consuming energy in various forms.

1422. Price, R., "The Energy Crisis: A Further View", *Congressional Record*, v. 117, no. 19, 8 December 1971, pp. E13236-13237.

Rep. Price describes the gravity of the energy gap and urges that Congress consider the imperative need for a comprehensive, long-term energy policy and for providing incentives to domestic producers to locate and develop new reserves.

1423. "The Energy Crisis", *Congressional Record*, v. 117, no. 194, 11 December 1971, pp. S21470-21472.

Gen. G. A. Lincoln discusses President Nixon's economic stabilization policy in light of the dependence of our economy on energy; describes the energy crisis the U.S. will continue to face unless planning and actions are begun now, aiming for 10 years into the future, to head off the fuel shortage and environmental problems.

1424. Ikard, F. N., "Statement Before the House Republican Task Force on Energy and Resources", *Congressional Record*, v. 117, no. 147, 5 October 1971, pp. E10436-10437.

Stresses the need for establishing a national energy policy directed toward decreasing our dependence on foreign oil and providing funds for oil drilling within the U.S. to replenish our diminishing oil reserves; states that U.S. economic progress is dependent on the petroleum industry; scores the advocates of a zero-growth policy for their indifference to the economic and environmental needs of the majority of Americans.

1425. Bible, A., "OMB Strikes Again – At Energy Research", *Congressional Record*, v. 117, no. 172, 12 November 1971, pp. S18354-18355.

Sen. Bible discusses the Administration's concern over the energy crisis; criticizes the withholding of necessary funds for the Atomic Energy Commission's Project Plowshare by the Office of Management and Budget; raises questions about the Administration's true concern over the energy crisis.

1426. "FTC Investigating Research & Development", *Washington Science Trends*, v. 27, no. 4, 1 November 1971, p. 21.

Describes the Federal Trade Commission's plans to determine whether large energy and petroleum companies are using their economic power to extract monopoly profit rates and/or inflate prices through contrived energy shortages by such tactics as

blocking coal-to-oil conversion research, coal-to-gas conversion research, pollution abatement, and nuclear-energy R&D.

1427. **Wilson, B., "Investigate Both Sides Before Accepting Nader's Comments", *Congressional Record*, v. 117, no. 175, 16 November 1971, pp. E12286-12288.**

Rep. Wilson presents a letter from C. Howard Hardesty, Jr., senior vice-president of Continental Oil Co., to his son and daughter refuting Ralph Nader's assertion that there is no fuel crisis, with quotes from responsible people highlighting the seriousness of the energy situation; describes actions by the oil industry to improve the environment, in answer to Nader's charge that the industry's ads are misleading.

ENERGY – ENVIRONMENT

1428. **Ruckelshaus, W. D., *Energy and the Environment*, Address to the World Energy Conference, 24 September 1971, 16 pp. (Reprints available from Environmental Protection Agency, Office of Public Affairs, Washington, D.C. 20460.)**

Discusses society's exponentially increasing demand for energy and concludes that this cannot continue indefinitely; describes the President's request for increased support of fast breeder reactor development and his power-plant-siting bill; describes steps being taken by the Environmental Protection Agency to find the proper balance between energy and the environment and recommends 3 guiding principles toward providing the energy needed without harm to the balance of nature.

1429. **Ramey, J. T., "The Energy Needs of the Nation and the Cost in Terms of Pollution", *AEC News Releases*, v. 2, no. 47, 24 November 1971, pp. 8-14.**

Evaluates U.S. energy sources and their potential for pollution; details the immediate and future energy needs; emphasizes the value of a detailed assessment of the benefits, costs, and risks of the various alternatives for energy production, but cautions against hasty actions such as that which caused the phosphates blunder.

1430. **Fabricant, N., and Hallman, R. M., *Toward a Rational Power Policy: Energy, Politics, and Pollution*, George Braziller, 1 Park Ave, New York, N.Y. 10016, 1971, 292 pp. ($3.95).**

Discusses the effects on human health and on the natural environment stemming from the operation of existing power-generation facilities; describes possibilities for significant improvements in current technology, as well as for the development of entirely new techniques for producing electricity; examines the interfaces among the environment, government regulatory policies, and utility practices, developing several possible solutions for both State and Federal Governments; 6 chapters, 3 appendixes.

1431. **Nelkin, D., "Scientists in the Environmental Controversy", *Science Studies*, v. 1, nos. 3/4, October 1971, pp. 245-261.**

Describes the limits and liabilities of three types of activities – substantive research, policy analysis, and political action – engaged in by scientists in the controversy over construction of a nuclear power plant; notes the "conflict between the ideals of scientific objectivity and those of public responsibility" and the heavy responsibility borne by scientists who subscribe to each.

ENERGY – NATIONAL POLICY

1432. Coughlin, R. L., "National Energy Policy – Part VIII", *Congressional Record*, v. 117, no. 134, 16 September 1971, pp. E9704-9707.

Rep. Coughlin calls for a set of priorities for fuel supplies and a long-range power development plan to forestall problems such as those being created by the mad rush to stripmine previously unprofitable low-sulfur coal in the American West; presents an Aug. 22 *New York Times* article describing the coal rush, its economic implications, and the resulting controversies.

1433. Howard, J. J., "Energy Needs in America", *Congressional Record*, v. 117, no. 166, 4 November 1971, pp. E11836-11838.

Rep. Howard reprints texts of two speeches dealing with the ever-increasing energy needs in the U.S. – the first stating that "the effective marshalling of our industrial, technological, and governmental capabilities will be needed to achieve a balance of continued energy supply and an improved quality of life", and the second holding that we must practice conservation and undertake a massive R&D program to establish a national energy policy that will effect a reconciliation between energy needs and environmental protection.

1434. White, D. C., "Energy, the Economy, and the Environment", *Technology Review*, v. 74, no. 1, October/November 1971, pp. 18-31.

Reviews the history of energy consumption in relation to population and GNP; discusses energy system modeling studies for planning purposes, covering demand and supply dynamics, price elasticities, resource availabilities, environmental factors, and economics; notes the sluggish response of the energy supply system to demand changes and the very large increases in energy cost necessary to modify demand, suggested by the sample studies presented.

1435. Linville, B., and Spencer, J. D., *Review of Bureau of Mines Energy Program, 1970* Bureau of Mines Information Circular 8526, 1971, 111 pp. (Available from Publication-Distribution, U.S. Bureau of Mines, 4800 Forbes Ave., Pittsburgh, Pa. 15213.)

Reviews the Bureau's research progress and problems encountered in 1970 in attaining its energy-research goal: to develop effective means of increasing the availability of the Nation's energy resources at reasonable cost and in such a manner as to reduce adverse social and environmental impacts; describes advances in coal, petroleum, natural-gas, and oil-shale fuels technology.

1436. *Electric Utilities Industry Research and Development Goals through*

the Year 2000, by the R&D Goals Task Force of the Electric Research Council, ERC Pub. no. 1-71, 1971, 180 pp. (Available from the ERC, 90 Park Ave., New York, N.Y. 10016. Price: $8.00.)

Describes in detail the current state of recommended research projects for energy conversion, including breeder reactors, fusion, conversion methods, fuel processing, MHD (open and closed cycles and liquid metal), fuel cells, storage batteries, unconventional cycles, solar power, thermionic conversion, geothermal energy, and air storage peaking; for each method, gives priorities, benefits, status of work, significant obstacles, and estimated costs and schedules through 2000.

1437. Sillin, L. F., Jr., "A Project for Prometheus", speech to Engineering Foundation Conference, 16 August 1971, *Congressional Record*, v. 117, no. 132, 14 September 1971, pp. H8412-8416.

Sillin, president of Northeast Utilities, discusses "gut issues" affecting the electric utility industry (public confidence, financial capacity, organization, regulation, ability to deal with current crises, etc.); proposes a 3-pronged industry research effort to (1) hasten the development of nuclear breeder technology, (2) develop new and improved generation and transmission equipment needed during the period of transition to the ideal power source, and (3) plan and execute a 30-year research effort ("Project for Prometheus") toward a pollution-free, risk-free power system, financed from industry revenues at a cost comparable to the Apollo Program's ($20 billion).

1438. Badillo, H., "Tiernan Explains National Power Grid Act", *Congressional Record*, v. 117, no. 161, 28 October 1971, pp. E11427-11428.

Rep. Badillo presents excerpts from a talk by Rep. Tiernan before the Northeast Public Power Association describing the bill to establish a public National Power Grid Corporation which would be responsible for construction and operation of large-scale generating plants and a nationwide system of transmission lines; points out advantages over single regional systems and features which would preserve competition in the industry and still assure adequate, reliable low-cost power consistent with enhancement of environmental values.

ENERGY -- NUCLEAR

1439. Johnson, W. E., "The Potential and Problems of Nuclear Power", Remarks at the National Energy Forum, Washington, D.C., 24 September 1971, *AEC News Releases*, v. 2, no. 41, 13 October 1971, 4 pp.

Commissioner Johnson outlines problems facing the nuclear power industry because of the tremendous growth expected (to about 1/2 of all U.S. generating capacity by the year 2000); discusses specifically how uranium production, enrichment capability, and nuclear equipment manufacturing will have to expand, and the difficulties involved.

1440. Ramey, J. T., "Nuclear Power, Environmental Research and Public Understanding", Remarks at American Nuclear Society Topical

Meeting on Nuclear Methods in Environmental Research, Columbia, Mo., 23 August 1971, *AEC News Releases*, v. 2, no. 38, 22 September 1971, pp. 3-9.

Atomic Energy Commissioner Ramey describes the suitability of nuclear power for supplying vitally needed clean energy in the near future; discusses measures used by the nuclear industry and the AEC to assure maximum safety; describes research on thermal and radiation pollution, and efforts to promote public understanding.

1441. "Geneva IV", A Special Issue of *Nuclear News*, v. 14, no. 10X, 15 October 1971, 132 pp.

Presents highlights of the papers presented at the Fourth United Nations International Conference on the Peaceful Uses of Atomic Energy, under topical headings by different reviewers, including an introduction by Seaborg; topics include energy resources, nuclear power cost trends, safety aspects, environmental effects, safeguards, performance, fuels, waste management, nuclear energy in developing countries, nuclear explosives, and research reactors.

1442. Benedict, M., "Electric Power from Nuclear Fission", *Technology Review*, v. 74, no. 1, October/November 1971, pp. 32-41.

Describes and compares the various types of nuclear reactors with one another and with fossil-fueled plants as power sources, from the standpoints of cost, availability, and problems; concludes that light-water reactors are the best solution to the short-term crisis, that fast breeders are needed for the longer range, and that testing should be initiated promptly on the serious problem of long-term storage of high-level radioactive wastes.

1443. Schlesinger, J. R., "Expectations and Responsibilities of the Nuclear Industry", Remarks before the Atomic Industrial Forum-ANS Annual Meeting, 20 October 1971, AEC News Release No. S-21-71. (Available from Public Information Office, U.S. Atomic Energy Commission, Washington, D.C. 20545.)

Clearly delineates the responsibilities of the AEC in relation to the Nuclear Power Industry: to provide technical options and to see that the technology is appropriately and safely used; emphasizes that while the AEC must and will make every effort to perform efficiently, the nuclear industry must learn to fight its own political, social, and commercial battles and must work toward the development of a comprehensive set of safety criteria and industry standards for nuclear plants.

1444. Skubitz, J., "The Atomic Energy Commission Seen in a New Light", *Congressional Record*, v. 117, no. 132, 14 September 1971, pp. H8416-8417.

Rep. Skubitz applauds the new cooperative attitude of the AEC toward criticism of atomic power – apparently reflecting the influence of new AEC Chairman James R. Schlesinger; reprints an article by R. C. Cowen from the Sept. 14 *Christian Science Monitor* that calls attention to the AEC's efforts to be responsive to constructive criticism, as manifested in talks at the 1971 Geneva Conference.

1445. Ford, D. F., Kendall, H. W., and MacKenzie, J. J., *A Critique of the New AEC Design Criteria for Reactor Safety Systems*, October 1971, 30 pp. (Available from Union of Concerned Scientists, P.O. Box 289, M.I T. Branch Station, Cambridge, Mass. 02139. Price: $1.00.)

Presents an exposition which concludes that "reactor safety with respect to major accidents and consequent widespread damage and loss of life is in a very unsatisfactory state"; recommends (1) placing responsibility for power reactor safety criteria with an agency independent of the AEC, (2) initiating a study to determine the hazards and define R&D programs needed, and (3) halting issuance of new nuclear reactor operating licenses until proven safeguards are provided.

1446. Wilson, R., "Politics of Nuclear Power in the United States", *Nature*, v. 233, no. 5320, 15 October 1971, pp. 453-454.

Presents a brief history of nuclear power development in the U.S. and of attacks on the nuclear power industry; examines problems of radiation leakage, thermal pollution, and safety in the nuclear industry.

1447. "Atoms for Development", *Nuclear Engineering International*, v. 16, no. 184, September 1971, pp. 745-772.

Reviews, in a collection of 19 articles by various authors, the development of nuclear power and energy reserves on a worldwide basis as well as individually in Argentina, Australia, Austria, Brazil, Chile, Denmark, Finland, India, Mexico, Israel, New Zealand, Norway, South Africa, Pakistan, South Korea, Taiwan, Thailand, and Yugoslavia.

1448. Doub, W. O., " 'The Right to be Heard' — Laying it on the Line", *AEC News Releases*, v. 2, no. 42, 20 October 1971, pp. 7-10.

Discuss procedural changes the AEC is considering, in order to provide earlier public participation in reactor licensing proceedings and sharper focus on matters of actual controversy; suggests changes in approach by industry which would help minimize hearing delays; states that responsible participation and recognition of the practical limits of the new system will be key elements in its success.

1449. Doub, W. O., "Federal-State Relationships in the Atomic Energy Program", *AEC News Releases*, v. 2, no. 45, 10 November 1971, pp. 8-11.

Describes efforts by the Commission directed toward cooperation with Federal, state and local agencies in regulatory and environmental aspects of atomic energy; urges that states participate in the AEC's licensing proceedings, development of safety standards and regulations, and environment-monitoring programs.

1450. Gravel, M., "The Illusion of Nuclear Safety", *Congressional Record*, v. 117, no. 154, 15 October 1971, pp. S16364-16372.

Calls attention to the second Cambridge report (Ref. 1445) and calls for "a complete moratorium on the construction of nuclear power plants" until at least the basic emergency cooling problems have been solved; questions Dr. E. Saenger's radiation experiments on terminal cancer patients under Department of

Defense auspices, summarizing the experiments and reprinting 2 *Washington Post* articles discussing them.

1451. Farmer, F. R., "Safety and Nuclear Power Plants: A British View", *Bulletin of the Atomic Scientists*, v. 27, no. 9, November 1971, pp. 47-50.

Discusses the problem of determining how safe is "safe", when it comes to specifying risk criteria for nuclear power plants; suggests that the key is the interrelationship between risk rate and consequences: the more severe the predicted consequences of a particular accident, the lower its probability of occurring should be.

1452. Gravel, M., "Another Nasty Nuclear Surprise", *Congressional Record*, v. 117, no. 154, 15 October 1971, pp. S16373-16378.

Express deep concern about what is to be done with the "indestructible radioactive debris" produced by existing and planned nuclear power plants; questions the feasibility of providing the permanent containment of over 99.999% of the radioactive inventory, as required to prevent serious pollution of the planet; presents 8 published reports and editorials that reflect the seriousness of the problem and the failure of the AEC to present a feasible solution.

1453. Holifield, C., "President Nixon's Statement on the Fast Breeder Program", *Congressional Record*, v. 117, no. 142, 28 September 1971, pp. H8787-8788.

Presents part of Nixon's speech at Hanford, Washington, indicating that industry agreed to contribute $200 million toward the first LMFBR, and that a second one would be authorized; includes a *Los Angeles Times* article covering the speech and commenting on AEC Chairman Schlesinger's remarks concerning income from U.S. exports of nuclear reactors.

1454. Hammond, L., "Breeder Reactors: Power for the Future", *Science*, v. 174, no. 4011, 19 November 1971, pp. 807-810.

Describes the influence of breeder reactors on the U.S. power industry and the cost of electricity; cites disagreements on the choice of breeder design and concerns over making the liquid-metal-cooled breeder a national goal; discusses the growing sentiment for consideration of alternative types of reactors in establishing a national energy policy.

1455. Hammond, A. L., "Management of U.S. Breeder Program Draws Criticism", *Science*, v. 174, no. 4011, 19 November 1971, p. 809.

Discusses the shortcomings and delays in the U.S. breeder program, attributed by some to the "autocratic style of management" of the program by its AEC head Milton Shaw; quotes critics' objections to his failure to investigate alternatives to the sodium-cooled breeder, to his over-management of the development effort, to his technical judgment on major decisions, to his optimistic claims for economic performance, and to his "excessive emphasis on reliability rather than on economic performance".

1456. David, E. E., Jr., Comments on Fusion Power, presented at dedication ceremonies for the "Texas Turbulent Torus", November 1971, *Atomic Energy Clearinghouse*, v. 17, no. 45, 8 November 1971, pp. 50-54.

Discusses the history and significance of the fusion effort and predicts its success around the turn of the century as an international achievement in which the U.S. will play a leading role; commends the "Texas Tokamak" as a combined industry-academia effort – part of the healthy international competitive-cooperative race to solve mutual problems.

1457. "Fusion Seen as 'Next Generation' Power Supply", *Washington Science Trends*, v. 27, no. 5, 8 November 1971, p. 25.

Reports on outlook for demonstrating feasibility in this decade, building a demonstration reactor in the 1990's, and a commercial plant around 2000; cites the promise of fusion power from inexpensive fuel with fewer problems of pollution, waste disposal, and safety than fission plants, so that fusion is evolving as part of the U.S. national energy policy.

ENERGY – UNCONVENTIONAL SOURCES

1458. Gravel, M., "A National Network of Pollution-Free Energy Sources", *Congressional Record*, v. 117, no. 190, 7 December 1971, pp. S20790-20794.

Reprints text of a proposal submitted by the University of Massachusetts to the National Science Foundation to investigate the feasibility of utilizing a wide variety of nonpolluting energy sources and gaseous fuel and of integrating them into nationwide networks; lists titles of the 15 appendixes which contain the technical details of the various methods proposed for study (e.g., winds, ocean thermal gradients, ocean currents, etc.).

1459. Cherry, W. R., *The Generation of Pollution Free Electrical Power from Solar Engines*, ASME Paper 71-WA/SOL-2, November 1971. (Available from ASME, 345 E. 47th St., New York, N.Y. 10017. Price: $3.00 to nonmembers; $1.00 to members.)

Points out the kinds of developments needed to reduce the costs of solar power enough to make this "pollution-free" energy source feasible for large-scale terrestrial use; includes developments in photovoltaics, higher performance solar cells and arrays, and long-life deep-cycle large-scale batteries; discusses solar energy interception and microwave transmission from synchronous satellites.

1460. Gravel, M., "Winning Money for Solar Energy", *Congressional Record*, v. 117, no. 185, 1 December 1971, pp. S20067-20070.

Sen. Gravel, solar energy's strongest supporter in Congress, presents statements from knowledgeable persons in confirmation of his position: that "it makes no sense to lament an alleged conflict between energy and the environment" if we continue to provide a multibillion dollar subsidy for nuclear electricity and "ignore our most obvious source of natural energy".

1461. Gravel, M., "Solar Energy: The Andersons' Proposal", *Congressional Record*, v. 117, no. 160, 27 October 1971, pp. S16887-16896.

Sen. Gravel discusses the findings of engineers James Hilbert Anderson, Sr. and Jr., who contend that abundant, economical, and safe electricity could be produced from sea-thermal power; Gravel asks that steps be taken to explore this possibility and presents 5 papers by the Andersons in which they explain the economic failure of earlier attempts at sea-thermal electricity, and why a plant of their design will be an economic success.

1462. Gravel, M., "Geothermal Power: The Magmamax Potential", *Congressional Record*, v. 117, no. 194, 11 December 1971, pp. S21472-21476.

Discusses the vast potential of geothermal steam and water as a clean and economic source of electricity; describes a new geothermal design which will eliminate the corrosion of valves and turbines sometimes associated with the present system; reprints three papers dealing with the economic aspects of geothermal energy.

1463. Bowen, R. G., "Geothermal – Earth's Primordial Energy", *Technology Review*, v. 74, no. 1, October/November 1971, pp. 42-48.

Describes the geological features that allow man to extract heat from the interior of the earth for useful purposes; gives the locations and characteristics of the major sources of geothermal energy throughout the world; demonstrates that geothermal power is economically competitive with that by other methods, without their undesirable environmental effects.

1464. Gravel, M., "Clean Energy Via the Wind", *Congressional Record*, v. 117, no. 190, 7 December 1971, pp. S20777-20779.

Sen. Gravel cites the case for wind as a source of clean energy and presents statements from reports, articles, and papers in support; reprints Appendix 6 of a proposal, "National Network of Pollution-Free Energy Sources", which provides a survey of windpower potential.

ENVIRONMENTAL AGENCIES

1465. "Interview with Stanley Greenfield", *Environmental Science & Technology*, v. 5, no. 10, October 1971, pp. 990-992.

S. Greenfield, assistant administrator for the Environmental Protection Agency, is interviewed on EPA's goals, manpower and funding, research, monitoring, and coordination with the environmental activities of other Federal agencies; lists EPA's 20 national environmental research centers.

1466. Bingham, J. B., "Regulatory Responsibilities of the Atomic Energy Commission", *Congressional Record*, v. 117, no. 166, 4 November 1971, pp. E11816-11818.

Rep. Bingham, sponsor of bill H.R.9542, to transfer the regulatory responsibilities of the AEC over nuclear power plants to the Environmental Protection Agency, presents testimony indicating that conditions today require an agency whose heads

devote full time and energy to regulation and have no conflicting responsibility.

1467. Train, R. E., "CEQ – Environmental Voice at the Top", *Environmental Science & Technology*, v. 5, no. 11, November 1971, p. 1075.
Discusses the duties and accomplishments of the Council on Environmental Quality and under the National Environmental Policy Act of 1969; notes the new role of the public in the Government planning process resulting from the requirements for environment-impact analyses of all proposed activities and for making these available to the public.

1468. "NIPCC: Advisory Board or Cartel?", *Environmental Science & Technology*, v. 5, no. 11, November 1971, pp. 1082-1083.
Describes the organization and current activities of the National Industrial Pollution Control Council, a 20-month-old presidential advisory committee that is currently studying the economic impact of pollution controls on U.S. industry, and that, contrary to criticism, has been effective in prodding recalcitrant industries to tackle their pollution problems.

1469. Muys, J. C., "The Environmental Recommendations of the Public Land Law Review Commission and the Legislative and Administrative Status of Their Implementation", speech before a National Institute of the American Bar Association, *Congressional Record*, v. 117, no. 164, 2 November 1971, pp. H10268-10270.
Describes the duties of the Review Commission and presents its environmental recommendations, grouped under 5 categories: environmental quality as a public land policy goal, planning for environmental quality, expansion of preservationist programs, improving environmental control mechanisms, and indirect environmental effects; briefly describes some actions directed toward implementing these recommendations.

1470. Huntley, J. R., *Man's Environment and the Atlantic Alliance*, June 1971, 47 pp. (Available from U.S. Department of State, Washington, D.C. 20520.)
Recounts the inception in 1969 of the Committee on the Challenges of Modern Society (CCMS), under NATO's North Atlantic Council, to stimulate action by member governments on problems of the human environment; describes specific activities of the CCMS in a wide range of topics (oil spills, water pollution, clean engine, air pollution, road safety, work satisfaction, disaster assistance, decision making, regional development, cities, drugs, and education; justifies NATO's role and discusses CCMS concepts, methods, and future.

ENVIRONMENTAL LEGISLATION

1471. Holden, C., "Environmental Legislation: 1971 Not a Year for Conclusive Action", *Science*, v. 174, no. 4013, 3 December 1971, pp. 1007-1010.
Calls attention to the fact that, other than defeat of the SST, environmentalists made no conclusive legislative gains in 1971;

describes provisions and status of some of the numerous proposals in Congress, covering water pollution, fuels and energy policy, Joint Committee on the Environment, power plant siting, pesticides control, Alaska native claims, land use planning, court suits, ocean dumping, and strip mining; speculates on 1972's conflicts.

1472. "One Hundred Two Monitor Council on Environmental Quality", *Congressional Record*, v. 117, no. 174, 15 November 1971, pp. E12213-12222.

Presents 20 questions and answers explaining the National Environmental Policy Act Section 102 environmental-impact statement process; for example: What is a 102 Statement? Who must prepare one? What role do members of the public have in the commenting practice? What legal rights does a citizen have under NEPA?

1473. Fish, H., Jr., "Congress Needs Adequate Information on Environmental Bills", *Congressional Record*, v. 117, no. 158, 21 October 1971, pp. E11162-11163.

Supports H.R. 11288 which would amend Sec. 102 of the National Environmental Policy Act of 1969 to require that environmental impact statements be included in Agency reports on legislation having environmental implications, in order to apprise Congressmen of the environmental issues involved before they attend committee hearings on such legislation.

1474. *Environmental Protection Act of 1971*, Hearings Before the Subcommittee on the Environment of the Committee on Commerce, U.S. Senate, 92nd Congress, 1st Session, on S. 1032, Part 1, 15-16 April 1971, 200 pp. (Available from Committee on Commerce, U.S. Senate, Washington, D.C. 20510.)

Presents the text, agency comments, supporting documents, and testimony relevant to S. 1032, "a bill to promote and protect the free flow of interstate commerce without unreasonable damage to the environment . . . and to establish the right of all citizens to the protection, preservation, and enhancement of the environment".

1475. "National Environmental Center Act of 1971", *Congressional Record*, v. 117, no. 190, 7 December 1971, pp. S20727-20738.

Presents discussions in the Senate concerning S. 1113, with amendments, a bill to establish a national environmental center to "provide integrated knowledge and understanding of the ecological, social, and technological problems associated with air pollution, water pollution, solid waste disposal, general pollution, and degradation of the environment and other related problems".

1476. Elliot, J. M., "An Environmental Manifesto", *Congressional Record*, v. 117, no. 190, 7 December 1971, pp. E13090-13092.

Prof. Elliot, Cerritos College, charges that the unwillingness or inability of elected state officials to enact effective antipollution legislation and to enforce such laws has deepened the environmental crisis; describes the role of Peoples Lobby, Inc., and cites examples of its power to force meaningful changes.

1477. Hanna, R. T., "Environmental Protection Agency", *Congressional Record*, v. 117, no. 177, 18 November 1971, pp. 12410-12411.

Lauds the Environmental Protection Agency's actions to combat air and water pollution; emphasizes, however, that the polluter must be regulated as well as the emitted pollutants and that state and local governments must share with the Federal Government the burden of reducing air pollution; reprints an article proposing higher taxes on automobiles to discourage their excessive use and provide funds for mass transit, thus providing a solution to both transportation and pollution problems.

1478. Aspin, L., "Economic Approach to Curb Pollution", *Congressional Record*, v. 117, no. 139, 23 September 1971, p. H8703.

Rep. Aspin introduces legislation to tax sulfur emissions from stationary sources in amounts increasing annually to 20¢/pound, which is high enough to induce polluters to use the best cleanup methods available and to encourage the development of even better ones.

1479. Abzug, B. S., "A Bold Program for Clean Water", *Congressional Record*, v. 117, no. 159, 26 October 1971, pp. S16797-16798.

Lends support to H.R. 10366, which would authorize $5 billion/year for construction of sewage facilities, provide for reimbursement to local and state governments which have prefinanced such construction, require states to set minimum water-quality levels for navigable waters, strengthen enforcement powers of the EPA, and permit individual citizens to sue the EPA if it fails to enforce standards set under law.

1480. Kemp, J. F., "Subsurface Waste Disposal Control Act", *Congressional Record*, v. 117, no. 138, 22 September 1971, pp. H8653-8656.

Rep. Kemp introduces H.R. 10800, which would give the Environmental Protection Agency exclusive control over subsurface disposal and storage of wastes; presents the text of the bill and a statement in its favor; reprints a statement giving the basis for opposition to deep-well disposal of waste acids at Bethlehem Steel's Lackawanna Plant.

1481. "Integrated Pest Control Bill: Statement by Senator Gaylord Nelson", *Congressional Record*, v. 117, no. 148, 6 October 1971, pp. S15924-15926.

Presents testimony in support of S. 1794, which would provide for expanded basic research in pest control; advocates placing controls on the use of broad-spectrum chemical insecticides and a demonstration and research program for integrated pest control (use of the best suited combination of alternate methods to suppress pest insects in a given crop situation); cites numerous reasons why such legislation is needed.

1482. *Powerplant Siting and Environmental Protection*, Hearings Before the Subcommittee on Communications and Power of the Committee on Interstate and Foreign Commerce, U.S. House of Representatives, 92nd Congress, 1st Session, May 4, 6-7, 11-13, 25-27, 1971, in 3 Parts, 1194 pp. (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price: $1.50 for Part 1; $2.00 for Part 2;

$1.75 for Part 3.)

Presents texts, summaries, supporting documents, and testimony during 9 days of public hearings on 8 House bills designed to insure adequate power to meet all reasonable demands at reasonable costs and, at the same time, to protect the environment.

FACILITIES FOR R&D

1483. Mozley, A., "Change in Argonne National Laboratory: A Case Study", *Science*, v. 174, no. 4004, 1 October 1971, pp. 30-38.

Cites the advent of the Argonne Universities Association and a new directorate, AEC's altered concept of objectives, and modification of the nuclear reactor program as the forces responsible for changes at Argonne; discusses the present stringent control over ANL by the AEC and the adverse reactions of laboratory scientific and engineering personnel, pointing out that organizations such as Argonne must remain independent to be fully effective.

1484. Holden, C., "Germ War Lab Salvaged", *Science*, v. 174, no. 4007, 22 October 1971, p. 387.

Describes the establishment of a program of basic research on cancer viruses at Fort Detrick, and the assortment of facilities for this research already available from previous biological warfare activities there.

1485. Mathias, C. M., Jr., "Environmental Health Effects Laboratory", *Congressional Record*, v. 117, no. 165, 3 November 1971, pp. S17554-17556.

Reprints material which answers questions concerning the proposed construction at Bethesda of a $4.5 million Navy Environmental Health Effects Laboratory (EHEL) to study stresses imposed by fleet, amphibious, and underseas (to 3300 ft) environments; discusses how it differs from the Submarine Medical Research Laboratory at New London, and why the research should not be turned over to industrial or university laboratories.

FINLAND

1486. "Finnish Society of Scientists and Members of Parliament", *SPPSG Newsletter*, v. 2, no. 7, August-September 1971, p. 24.

Discusses TUTKAS, the Society founded in 1970 as a forum for intercourse between scientists and Parliament and to foster critical examination of decision planning and procedures related to science.

FOREIGN AFFAIRS

1487. Basiuk, V., "Technology, Western Europe's Alternative Futures, and American Policy", *Orbis*, v. 15, no. 2, Summer 1971, pp. 485-506.

Reviews some technological trends (decreasing importance of

resource location, global geo-technical integration, increasing cost and scale of technology, acceleration of technological change, and increasing importance of nonmilitary technology to national security); outlines Western Europe's technological ailments and considers 3 alternative response models for European governments (technological nationalism, cooperative federalism, common government); suggests a functionally oriented Western Europe as the most likely and desirable, with U.S. policy favoring cooperative technical programs.

1488. Ribicoff, A., "Is this the Age of Ecopolitics?", excerpts from speech presented last June in Budapest, *Congressional Record*, v. 117, no. 135, 17 September 1971, pp. S14482-14483.

Sen. Ribicoff, chairman of the International Trade Subcommittee, discusses the shift occurring away from the politics of arms balance and land ownership (geopolitics) to that of technology, economics, and trade (ecopolitics); calls for mutual education of people in the East and West into the differences between their economic systems as an essential step toward promoting economic relations, responsibility, cooperation, and peace.

1489. "FAS Serving as Link to China", *Science & Government Report*, v. 1, no. 18, 25 November 1971, p. 3.

Discusses the fact that Mainland China has ignored attempts by the National Academy of Sciences to serve as the medium for scientific exchanges [see *SPR* 4(2):551], while recognizing the anti-Administration Federation of American Scientists, several of whose members have already visited China.

1490. "Sixth Natural Resources Conference Held by United States and Japan", *U.S. Department of State Bulletin*, v. 65, no. 1683, 27 September 1971, pp. 334-335.

Reviews the history since 1964 of the U.S.-Japan Conferences on Natural Resources (UJNR) and presents highlights of the Sept. 2-3 meeting in Washington at which delegates reviewed activities of the 18 UJNR panels in planning future joint efforts, developed mechanisms for coordination, approved new subjects for cooperation, and discussed natural resources topics.

1491. *United States – Italy Cooperative Science Program*, National Science Foundation Brochure NSF 70-15, 3 pp. (Available from Office of International Programs, National Science Foundation, Washington, D.C. 20550.)

Describes the Program established in 1966 to promote cooperative research, information-exchange seminars, and exchanges of visits by scientists; NSF, the focal point for the U.S. portion of the program, welcomes specific proposals for cooperative activities in any field of science; the Consiglio Nazionale delle Ricerche (CNR) is the corresponding Italian agency.

1492. *India-United States Exchange of Scientists*, National Science Foundation Brochure NSF 71-41, 3 pp. (Available from Office of International Programs, National Science Foundation, Washington, D.C. 20550.)

Describes the program established in 1967 to provide support for exchange of scientists and engineers and for collaboration of U.S. senior scientists with Indian colleagues in any of a wide range of disciplines for periods up to several months; NSF will entertain proposals from American scientists (get applications from address above) for selection and submission to the Council of Scientific and Industrial Research (CSIR) in India for concurrence.

1493. *International Development Institute,* Report of an Ad Hoc Committee of the Board on Science and Technology for International Development, July 1971, 57 pp. (Available from the Office of the Foreign Secretary, National Academy of Sciences, 2101 Constitution Ave., N.W., Washington, D.C. 20418.)

Recommends compliance with Nixon's request [*SPR* 4(2):461] for the establishment of the IDI as a permanent, independent Federal body, governed by a President-appointed board, to be the principal agency for U.S. civilian technical cooperation abroad (replacing AID); suggests that IDI be the "source of policy guidance and U.S. funds intended for the United Nations Development Programme and other technical assistance programs", and that it be free to contract with other institutions (including universities).

FRANCE

1494. "France: Trend of R&D Expenditure 1963-1975", *Science Policy News,* v. 3, no. 2, September 1971, p. 25.

Projects gross R&D expenditures for each year from 1963 (F. 6,462 million) through 1975 (F.. 23,450 million), and breaks them down by recipient (universities, CNRS, Grandes Ecoles, other public bodies, industry, nonprofits), R&D category (OECD standard, social sciences, balance of trade), source (about 1/3 private and 2/3 Government), and programs (international, civil aviation, defense, nuclear, space, computers, development assistance, and education).

1495. "France and Innovation", *Nature,* v. 234, no. 5326, 26 November 1971, p. 166.

Describes the issues considered by attendees at a 3-day colloquium on "Innovation and Progress", and the measures (chiefly economic) already taken by France's Ministry of Industrial and Scientific Research to spur innovation.

1496. "France: Actions Thematiques Programmees (ATP)", *Science Policy News,* v. 3, no. 2, September 1971, pp. 24-25.

Defines ATP as "co-ordinated activities related to a specific theme", for which Government funding is budgeted (F. 15 million in FY 1971) and bids are invited from the scientific community several years in advance with the idea of gathering scientists from different disciplines to work on a line of research; cites examples, including physics (materials, metastable states) and social sciences (education, data processing in social sciences, socio-economic problems, and teaching methods).

1497. "The Future of the CNRS" (in French), *La Recherche*, no. 15, September 1971, pp. 712-715.

Presents a question-answer interview with Prof. Hubert Curien, Director-General of the Centre National de la Recherche Scientifique since 1969, which traces the development of this research institution from its founding in 1939 and tries to predict its future in the light of national budget woes and a proliferation of rival French organizations.

GOVERNMENT-SCIENCE INTERACTION

1498. Lepowski, W., "Special Report: Banking on Technology to Cure America's Ills", *Science Forum*, v. 4, no. 6, December 1971, pp. 31-33.

Discusses the Administration's "technological game plan . . . to rescue the country from social disrepair and economic stagnation"; points to W. M. Magruder as "chief orchestrator", and speculates on the politics of the interaction of Magruder with Nixon's Science Adviser David and the Office of Science and Technology; expresses concern over Magruder's "systems engineering of social goals".

1499. Lewis, H. J., "The Enhancement of Technology and Vice Versa", *SPPSG Newsletter*, v. 2, no. 8, October 1971, pp. 1-4.

Describes and analyzes the circumstances under which William M. Magruder was appointed to serve as Special Consultant to President Nixon to assist the Domestic Council and the Council on International Economic Affairs in developing of R&D policy leading to new technology; discusses Magruder's actions and his place in the Executive heirarchy.

1500. Perl, M. L., "The Scientific Advisory System: Some Observations", *Science*, v. 173, no. 4003, 24 September 1971, pp. 1211-1215.

Analyzes the scientific advisory system and concludes that it is effective on limited technical questions, but not on broad technical issues because it is impeded by (1) its many functions, (2) the confidentiality limits imposed, and (3) the many steps necessary to gain influence in Washington and the tendency of the scientific advisor to forget his real role in the interest of maintaining that influence.

1501. Hutchinson, E., "Government Laboratories and the Influence of Organized Scientists", *Science Studies*, v. 1, nos. 3/4, October 1971, pp. 331-356.

Cites two facts revealed by a comparative study of case histories of two British laboratories in rebuttal to the assertion that since bureaucrats hold the public purse strings, they can largely determine how scientists should behave: (1) a concerted effort by a body of qualified scientists enables it to force its will on the bureaucrats and (2) an attempt by a bureaucracy to run a scientific activity without involving a large number of outside scientists will result in failure to reach its scientific aims.

1502. Gillette, R., "Human Environment Conference: Citizen Advisers

Muddle Through", *Science*, v. 174, no. 4008, 29 October 1971, pp. 479-481.

Discusses the reasons for the ineptness of the State Department's "distinguished citizens" advisory committee designated to transmit the public's view and advice to guide U.S. preparation for the U.N. Conference on the Human Environment in Stockholm next June; suggests careful consideration in the future of the drawbacks of such committees as public sounding boards in diplomatic matters.

1503. Werskey, P. G., "The Perennial Dilemma of Science Policy", *Nature*, v. 233, no. 5321, 22 October 1971, pp. 529-532.

Examines Nature's views on the interrelationships between Government, science, and society; describes the model for a national science policy in Britain created by *Nature* under the auspices of its editor Sir Richard Gregory.

1504. Sherwood, M., "Is Science Policy Democratic?", *New Scientist*, v. 52, no. 773, 9 December 1971, p. 70.

Discusses the results, published in *Research Policy*, v. 1, of a series of opinion polls in the Federal Republic of Germany about R&D priorities, which show that Federal support of R&D in specific fields is not at all in accordance with the public preference.

1505. "Tax Incentives for R&D", *SPPSG Newsletter*, v. 2, no. 10, December 1971, pp. 17-18.

Presents adaptation from an article by D. B. Langmuir and I. Stockel which discusses possible incentives to encourage industrial R&D and its utilization: tax credits and aid with antitrust and patent problems, as well as assistance in improving relationships with labor groups.

1506. "European Community: Patent Conventions", *Science Policy News*, v. 3, no. 2, September 1971, p. 28.

Discusses prospects for a *European Patent* to come into force early in 1973, based on two conventions expected to be finalized by the 19-nation Governmental Conference on European Patents by June 1972; the first convention, open to all European countries, will relate to the issuing procedure, while the second will give the European Patent the status of a unitary patent *(Community Patent)* for Common Market Member States.

HEALTH

1507. McKenzie, S., "National Health Policy: The Docs Meet the Pols", *SPPSG Newsletter*, v. 2, no. 9, November 1971, pp. 1-3.

Summarizes the gist of talks given at the 5-day 82nd annual meeting of the Association of American Medical Colleges, where members of the academic medical community and representatives of the Federal Government agreed on policy goals — improvement of the Nation's health-care system and provision of larger numbers of adequately trained physicians and allied health personnel.

1508. Strickland, S. P., "Integration of Medical Research and Health Policies", *Science*, v. 173, no. 4002, 17 September 1971, pp. 1093-1103.

Describes Congressional actions toward the creation of a separate cancer research agency; traces the evolution of national health policy, including the development of the National Institutes of Health and the Department of Health, Education, and Welfare; discusses the rise and decline in Federal health R&D spending in the 1960's; assesses the success of past national health policy and discusses its effect on medical education and the integration of health and medical research programs.

1509. "Institute of Medicine: Broad-Spectrum Prescription", *Science*, v. 174, no. 4012, 26 November 1971, p. 929, 932-933.

Describes the National Academy of Sciences' Institute of Medicine and its membership mix of nurses, dentists, hospital administrators, researchers, and physicians, types of studies the institute will undertake, and its aim: to influence major decisions in the health field.

1510. Podell, B. L., "The Conquest of Cancer", *Congressional Record*, v. 117, no. 176, 17 November 1971, p. E12308.

Supports the proposed National Cancer Attack Act of 1971 to provide funds for cancer research, which would be distributed to the Cancer Institute through the National Institutes of Health; argues against a proposal to establish a separate agency for cancer research.

1511. "Joint U.S.-Yugoslav Project", *BioScience*, v. 21, no. 20, 15 October 1971, p. 1050.

Describes plans for six U.S.-Yugoslav workshops financed by an NSF grant using some U.S.-owned foreign currency and administered by the American Institute for Biological Sciences, to examine how biomedical engineering may help provide essential health care services more efficiently for larger numbers of people the world over.

HOUSING AND BUILDING CONSTRUCTION

1512. Kirchner, E., "Can a $120 Million R&D Injection Transform a $27 Billion Industry?", *Innovation*, no. 25, October 1971, pp. 18-27.

Discusses Operation Breakthrough, a multiple prototype experiment in industrialized housing started some 2 years ago by the Department of Housing and Urban Development (HUD), and the implications for R&D in the social sector.

INDIA

1513. "India: New Priorities for Scientists; Science Studies at Jawaharlal Nehru University", *Science Policy News*, v. 3, no. 2, September 1971, p. 26.

Reports on discussions by the Minister for Science and Technology concerning the role of science and technology in

executing political and social tasks, such as removal of poverty, unemployment, and disparities; Parliament is drawing up a science policy, for which scientists are asked to help assign priorities; announces the start of a university Centre for Science Policy to study technology transfer, technology assessment, and the sociology of science.

1514. "India: Sarkar Committee Report on CSIR", *Science Policy News*, v. 3, no. 3, November 1971, p. 35.

Presents highlights of the report to the Prime Minister by a committee of scientists and Parliamentarians that reviewed the affairs of the Council for Scientific and Industrial Research (CSIR), cleared the organization of alleged irregularities in appointments, suggested a reorganization, and recommended the creation of a National Commission for Science and Technology to plan and coordinate scientific activities, while CSIR Headquarters would evolve policies and evaluate their implementation; announces takeover of CSIR Directorship in August 1971 by Dr. Y. Nayudamma.

1515. Hariharan, P., "Bridging the Gap Between Industry & Scientific Research", *Journal of Scientific and Industrial Research (New Delhi)*, v. 30, no. 6, June 1971, pp. 261-262.

Examines the reasons for the significant lack of contact between research institutions and industry in India; emphasizes that bridging this gap is essential to India's development.

1516. Nanda, K., "Will India Go Nuclear?", *Bulletin of the Atomic Scientists*, v. 27, no. 10, December 1971, pp. 39-41.

Predicts that India's nuclear policy will remain a political issue because of persistent demand for review of policy since China's nuclear demonstration, because relations with China have not improved, and because the Indian public strongly favors a nuclear deterrent; describes the divergent views within the ruling party and the opposition parties; believes pressure on the Government will increase with increasing nuclear developments in China, but defense will not be the determining factor in deciding to go nuclear – rather it will be India's desire for higher standing in the family of nations.

INFORMATION MANAGEMENT

1517. Davis, J. W., "UNISIST", *Congressional Record*, v. 117, no. 147, 5 October 1971, p. E10444.

Presents a speech by Dr. W. D. McElroy, chairman of the U.S. delegation to the Intergovernmental Conference for the Establishment of a World Science Information System (UNISIST), which supports the establishment of UNISIST and emphasizes that the advantages offered by such a system outweigh the difficulties and obstacles to be overcome in its formation [see *SPR* 4(2):568].

1518. "Slowly but Steadily with Information", *Nature*, v. 234, no. 5327, 3 December 1971, pp. 268-269.

Discusses the many points to be considered by UNESCO's World

Science Information System, UNISIST, in developing workable and lasting machinery for the free exchange of scientific information; suggests that there is much useful work that UNISIST can do now (especially in standardization), but that it should proceed cautiously.

1519. "Scandinavia: Information Co-ordinating Body", *Science Policy News*, v. 3, no. 2, September 1971, pp. 26-27.

Announces the formation of NORDOK, to coordinate scientific information and documentation policy for the Scandinavian countries, with temporary headquarters at the Norwegian National Library under H. Tveteras; aims are to draw up rules for exchange, coordinate international information systems, set pricing policy, and advise authorities and information offices; also, Switzerland is opening a science policy documentation center at the Central Library of Parliament in Bern.

JAPAN

1520. *Japanese Science Policy in the 1970's*, A Report of the Council for Science and Technology, April 1971. (Available from Planning Bureau, Science and Technology Agency, Prime Minister's Office, 2-2-1 Kasumigaseki, Chiyoda-ku, Tokyo, Japan.)

Describes attitude to be adopted in developing science and technology policy for the 1970's, viz., that science and technology's purpose is betterment of human well-being through fulfillment of social and economic needs; presents specific objectives and discusses measures for attaining them.

1521. *Summary of White Paper on Science and Technology – New Demands on Technical Innovation*, April 1971. (Available from Planning Bureau, Science and Technology Agency, Prime Minister's Office, 2-2-1 Kasumigaseki, Chiyoda-ku, Tokyo, Japan.)

Summarizes in 3 parts the course of technical innovation in Japan since World War II, trends in Japanese scientific and technical activities, and Government measures taken in 1970 to promote science and technology in Japan.

1522. *Science and Technology Agency: An Outline*, 1971. (Available from Planning Bureau, Science and Technology Agency, Prime Minister's Office, 2-2-1 Kasumigaseki, Chiyoda-ku, Tokyo, Japan.)

Describes historical background of Japan's Science and Technology Agency, its major functions and activities; charts show the organization of the agency and the administrative structure of science and technology in Japan.

1523. "Realigned National Space Program Adopted by Japanese", *Aviation Week & Space Technology*, v. 95, no. 18, 1 November 1971, pp. 64-66.

Describes a report by the Japanese Space Activities Commission, responsible for the management of Japan's space program, discussing Japan's attempts to achieve technological independence in the space industry; describes Japan's projected space program.

1524. "Japanese Aerospace Industry Nears Parity with the West", *Aviation*

Week & Space Technology, v. 95, no. 18, 1 November 1971, pp. 34-37.

Describes efforts by Japan's government to develop an aerospace industry comparable with that of the West by initiating a series of ambitious design-development programs over the next 10 years; a number of these will be on a joint basis with the U.S. and European manufacturers; describes a number of specific projects included in these programs.

LAND USE

1525. *National Land Use Policy*, Hearings Before the Committee on Interior and Insular Affairs, U.S. Senate, 92nd Congress, 1st Session, on S. 632 and 992, 18 May and 7 June 1971, In 2 Parts, 506 pp. (Available from Committee on Interior and Insular Affairs, U.S. Senate, Washington, D.C. 20510.)

Presents documents and testimony on two bills to amend the Water Resources Planning Act to include provision for a national land use policy and to establish such a policy.

1526. *Land Resource Development for Developing Nations*, 1971 (Brochure available from U.S. Department of the Interior, Bureau of Land Management, Interior Building, Washington, D.C. 20240.)

Describes the types of skills available within the Bureau of Land Management (range, watershed, recreation, wildlife, timber, road, fire and pest control, surveying, titles and records, land use); presents examples of overseas assistance previously provided, and gives details regarding availability of land-management services in the U.S. and to other nations.

MANAGEMENT OF SCIENCE

1527. Cetron, M. J., and Goldhar, J. D. (Eds.), *The Science of Managing Organized Technology*, Gordon and Breach, Science Publishers, New York – London – 3 and 4 – 789 pp. ($39.60 for both double volumes, paperback.)

Consists of a collection of articles grouped into 17 chapters arranged in 4 Parts, each containing an introduction, description, and summary by the editors; Part I, "Background for R&D Management" has 31 readings illustrating the forces and pressures affecting managerial decisions in the R&D area; Part II, "R&D Decision Making", has 17 readings surveying the tools for goal setting, technological forecasting, projection evaluation and selection, and planning; Part III, "Administering the R&D Process", has 21 readings that highlight the difference between traditional administration and management of R&D; Part IV, "Tying the Pieces Together", has 12 readings, summarizing the problem of managing organized technology most effectively and looking at the possible future environment for R&D managers.

1528. Clayton, R., "A Convergent Approach to R&D Planning and Project Selection", *Research Management*, v. 14, no. 5, September 1971, pp. 68-74.

Describes the idealized attitudes of R&D managers – toward the invention/innovation process as either "rational" or "nonrational", and views their approaches to R&D planning as either "analytical" or "laissez faire"; characterizes each of these attitudes, points out its problems, and outlines a way in which the best elements of each might be combined to form a "convergent" approach to R&D planning.

1529. Gee, R. E., "Research on Research", *Chemical & Engineering News*, v. 49, no. 39, 20 September 1971, p. 1.

Discusses the need for studies of the research process in industry to answer questions on the magnitude of support, methods of evaluating effectiveness, methods of selecting projects, ways of determining productivity of R&D workers, and how to improve relations between R&D personnel and management.

1530. Schumacher, D., "Cooperation of Government, Science, and Industry in R&D – A Systems View", *Policy Sciences*, v. 2, no. 3, Summer 1961, pp. 279-286.

Investigates the roles of Government, science, and industry in meeting the R&D requirements of our society; considers the present state-of-the-art of the cooperation involved; emphasizes the need for integrated planning, programming, and budgeting in R&D; comments on the European technology crisis.

1531. "On the Control of Science: Four Views", *Bulletin of the Atomic Scientists*, v. 27, no. 10, December 1971, pp. 23-38.

Presents 4 papers from an April Colloquium on "The Control of Science for Civil Needs": I. "Technical Power and People – The Impact of Technology on the Structure of Government", by A. W. Benn, M. P. and former Minister of Technology and Minister of Power, U.K.; II. "Technology and Society – The Real Issues", by M. Tribus, Senior Vice President of Research and Engineering for Xerox Corp.; III. "The Engineer in the Establishment", by D. C. Drucker, Dean of Engineering, University of Illinois; and IV. "On the Social Deployment of Science", by A. G. Mencher, Science Attache with the U.S. Embassy in London.

1532. Long, T. D., "The Government of Science: a Comparative Approach", *Science Studies*, v. 1, nos. 3/4, October 1971, pp. 263-286.

Notes the increased number of science policymaking bodies and the growing influence on national policy: compares the functions of these bodies among 14 countries in Western Europe, North America, and East and Southeast Asia; cites technological innovation in industry and interdisciplinary research in private institutions as evidence of a "shift from experiment and borrowing of institutionalized mechanisms, to a phase involving the transfer of techniques for dealing with specific policy issues.

1533. Bondi, A., "Focusing on a Single Objective: A Contribution of Applied Research to Science and Engineering Methodology", *Chem Tech*, October 1971, pp. 592-598.

Discusses the ground rules for the successful conduct of focused research, i.e., the technique of focusing the attention of scientific

and engineering experts from different disciplines on a single problem or project; presents 3 examples of this type of research, and discusses its applicability to university situations.

1534. *International Aspects of Technological Innovation*, Proceedings of a Science Policy Symposium, Paris, France, 7-9 September 1970, Science Policy Studies and Documents, Unesco, no. 26, 1971, 90 pp. (Available from Unesco Publications Center, P.O. Box 433, New York, N.Y. 10016. Price: $2.00.)

Presents papers following 4 rounds of exchange by the 11 symposium panelists, on the integration of technological research and innovation policy into overall national planning in science and technology; emphasis was on finding and exploring points of possible disagreement; topics include inhibition of technological development in India, competition and cooperation in innovation, technology transfer strategy, and technology in developing countries.

MANPOWER, TECHNICAL AND SCIENTIFIC

1535. *Job Prospects of 1971 Graduates*, Bulletin No. 20. (Available from EJC, Dept. P, 345 E. 47 St., New York, N.Y. 10017. Price: $1.00.)

Points out that the demand for engineers, though lower than in recent years, is stronger than for most other occupations; only 9% of the 1971 graduates in engineering were without job offers or other plans at the time of graduation, 55% had jobs or offers, and the rest were going into military service or had other plans.

1536. "Science/Engineering Employment: More Declines?", *Washington Science Trends*, v. 27, no. 11, 20 December 1971, pp. 61-62.

Reviews the latest forecasts by the Aerospace Industries Association (write 1725 DeSales St., N.W., Washington, D.C. 20036) and the Manpower Administration (U.S. Dept. of Labor, Washington, D.C. 20210), indicating further job cuts for scientists and engineers; presents some statistics on the Federal Technology Mobilization and Reemployment Program, which has placed 2,864 scientists and engineers and just received $36 million in "obligation" funds.

1537. "Hodgson Names Advisory Group on Professional, Scientific Technical Manpower", *SPPSG Newsletter*, v. 2, no. 7, August-September 1971, pp. 39-40.

Announces the naming of a 22-member group from a wide range of occupations as a subcommittee of the National Manpower Advisory Committee to advise the Department of Labor and recommend actions for dealing with critical problems of professional, scientific, and technical manpower.

1538. *Occupational Manpower and Training Needs*, Bulletin 1701, 1971, 81 pp. (Available from U.S. Department of Labor, Bureau of Labor Statistics, 219 S. Dearborn St., Chicago, Ill. 60604. Price: 75 cents.)

Presents the following data for each of 232 occupations: 1968 employment, projected 1980 needs, average annual openings through 1980, how workers are trained, and number currently

being trained; shows how the data can be used for planning and evaluating vocational, educational, and training programs.

1539. Lavoie, F. J., "Engineer Retraining: Hope or Hokum?", *Machine Design*, v. 43, no. 29, 25 November 1971, pp. 66-72.
Presents the pros and cons of aerospace/defense engineer retraining; discusses current Government efforts and proposed legislation in this area, and the growing feeling that these industries themselves should take on the retraining or reorienting job.

1540. Waldmann, R. J., "Redirection and Re-Employment", *Technology Review*, v. 74, no. 2, December 1971, pp. 27-31.
Waldmann, Staff Assistant to Nixon, emphasizes the Administration's point of view of the problem of increasing unemployment of scientists, engineers, and technicians; recognizes that social, economic, and political forces are altering priorities and forcing a reallocation of national resources that affects employment; discusses the specific Federal programs designed to ease the burden of this reallocation on scientists and engineers.

1541. *New Services for Engineers, Scientists, and Technicians: Putting Top Talents Back to Work*, 1971. (Brochure available from U.S. Department of Labor Manpower Administration, Washington, D.C. 20210.)
Describes the efforts being undertaken under the Technology Mobilization and Reemployment Program in the areas of job finding, grants, retraining, and skill conversion; presents details regarding eligibility for the program and whom to contact.

1542. "New Service Jobs", *Chemical & Engineering News*, v. 49, no. 37, 6 September 1971, pp. 5-6.
Discusses efforts of state science advisers and Nixon's science adviser to convince state, regional, and local governments to hire unemployed scientists and engineers for some of the $1 billion worth of new public service jobs under the Emergency Employment Act of 1971, in such fields as waste collection and disposal, computer applications, health care, education, criminology, land use, construction, and pollution control; quotes a Labor Department spokesman that only a few hundred of the 120,000 to 150,000 jobs under the Act will go to scientists and engineers.

1543. *Employment of New PhD's and Postdoctorals in 1971*, Survey Report prepared in Manpower Studies Branch, August 1971, 22 pp. (Available from Office of Scientific Personnel, National Research Council, 2101 Constitution Ave., N.W., Washington, D.C. 20418.)
Analyzes questionnaire replies from department chairmen representing 13,000 scientists who got Ph.D.'s in 1970; reports 1.2% in jobs unrelated to their training and 1.6% unemployed (compared to 0.7% and 0.9% in 1969), with job prospects best in the social sciences and poorest in physics.

1544. *Mobility of PhD's Before and After the Doctorate with Associated Economic and Educational Characteristics of States* (Career Patterns Report No. 3), Research Division, Office of Scientific Personnel, National Research Council, 1971, 200 pp. (Available from Printing and Publishing Office, NAS, 2101 Constitution Ave., N.W., Washington, D.C. 20418. Price: $5.95.)

Examines movement of PhD's within the U.S. and internationally, noting that though some leveling has occurred over the past 50 years, PhD's in the U.S. still concentrate in the Northeast Corridor and on the West Coast; discusses the international brain drain (with statistics) as a complex process with benefits to the highly trained immigrants, to the U.S., and to the world.

1545. "Intern Program at Fed Labs", *Chemical & Engineering News*, v. 49, no. 40, 27 September 1971, p. 9.
Describes a $3 million program developed by the Office of Science and Technology to be administered by the National Science Foundation, providing 420 or more 1-year Presidential internships in science and engineering in Federally funded laboratories; the $7000 Government stipend for each intern is expected to be at least matched by the labs.

1546. Gillette, R., "Manpower: Federal Register of Scientists 'Discontinued' ", *Science*, v. 174, no. 4004, 1 October 1971, pp. 42-44.
Announces the "mothballing" of the National Register of Scientific and Technical Personnel; discusses the Register's value in monitoring supply and demand of scientific manpower and in revealing the dimensions of the scientific-manpower crisis; cites scientists' unemployment figures obtained in a survey based on the register, which indicate that the job market is at its lowest ebb since World War II.

METRICATION

1547. Parsons, H. C., "Metric Conversion & U.S. Leadership in Technical Innovation & World Trade", *Professional Engineer*, v. 41, no. 12, December 1971, pp. 24-27.
Points out items that must be considered by the U.S. in evaluating the merits of conversion to the metric system as a factor in retaining world leadership; recommends an aggressive standardization program and acceptance of the cost of conversion at this time to avoid "defeat in the marketplace and a requirement that we accept the metric system at some future date after this defeat".

MULTINATIONAL SCIENCE ACTIVITIES

1548. "Organization for Economic Cooperation and Development Science Ministerial, Paris, 13-14 October 1971", *SPPSG Newsletter*, v. 2, no. 10, December 1971, pp. 7-10.
Stresses the need for closer integration of science policy with social, economic, and political considerations, aimed toward solution of societal problems, and for collaborative efforts by OECD countries in areas such as environmental quality, resource conservation, and communication; presents U.S. proposals for (1) developing a method of coordinating the planning and construction of "big science" facilities on a national basis, (2) encouraging international cooperation, with discrete elements being under-

taken in national institutions, and (3) facilitating mobility of scientific workers among member countries.

1549. "International Institute for Management of Technology", *SPPSG Newsletter*, v. 2, no. 9, November 1971, p. 22.

Announces the signing of the intergovernmental Convention establishing the IIMT in Milan on 6 October 1971 [see *SPR* 3(5):8163 for detailed plans]; objective is to improve European management performance in development and use of technology in both public and private sectors; funded by industry and participating governments; classes scheduled to start in fall, 1972.

1550. "Opportunities for Collaboration in Europe", *Nature*, v. 233, no. 5316, 17 September 1971, pp. 152-153.

Discusses changes that need to be made to promote successful scientific collaboration among European institutions: integration of Western Europe's university systems to encourage participation by outstanding foreign researchers; concentration on technical rather than political benefits of cooperation; establishment of a forum within which research councils, public research foundations, and universities can overcome obstacles stemming from their heterogeneous R&D administrative structures and enter into joint programs.

1551. "Civilian Technology: European Plans", *Washington Science Trends*, v. 27, no. 8, 29 November 1971, pp. 43-44.

Discusses past and planned efforts toward European cooperation in the application of science and technology to civilian goals, citing tentatively agreed-upon projects (pilot data-transmission network, radio aerial efficiency improvement, materials for gas turbines and desalination plants, pollution projects, medium-term weather forecasting center, and information exchange on computer programs).

1552. "European Laboratory: Vain Effort?", *Nature*, v. 233, no. 5320, 15 October 1971, p. 440.

Describes efforts by the Plasma Physics Division of the European Physical Society to avert the threatened closure of the financially troubled European Space Research Institute (ESRIN) by its parent European Space Research Organization (ESRO); discusses the possibility of transferring the laboratory to some other European or Italian organization.

1553. "Resolutions, First Soviet-American Conference on Communication with Extraterrestrial Intelligence (CETI)", *Astronautics and Aeronautics*, v. 9, no. 11, November 1971, pp. 35, 57.

Describes the conclusions of participants in the U.S.-Soviet Conference on extraterrestrial civilizations and contact with them, held September 5-11, 1971, in the USSR; attention was paid to such problems as: origin and development of technological civilizations, problems in searching for intelligent signs or evidence of astroengineering activities, and possible consequences of contact with extraterrestrial civilizations; presents 5 recommendations for future directions for such research.

1554. "One Bridge More", *Nature*, v. 233, no. 5321, 22 October 1971, pp. 512-513.

Announces the agreement on Heidelberg as the site of the European Molecular Biology Organization laboratory, and discusses the actions necessary to provide funds for its construction.

NATIONAL SECURITY

1555. Janowitz, M., "The All-Volunteer Armed Force and Environmental Control", *Congressional Record*, v. 117, no. 135, 17 September 1971, pp. E9724-9725.

Suggests using the armed forces during peacetime for such community-service tasks as building housing for low-income families, combating air and water pollution, providing medical and social services to problem areas, and handling the effects of natural and man-made disasters; discusses the benefits of such a course, and recommends the kind of organization and training needed to implement it.

1556. "Thumbs Down on Think Tanks", *Science*, v. 174, no. 4013, 3 December 1971, p. 1008.

Points out recommendations in a report by the House Appropriations Committee that military think tanks – notably the Air Force's Rand, the Army's Research Analysis Corp. (RAC), the Navy's Center for Naval Analysis (CNA), and the Defense Dept.'s Institute for Defense Analysis (IDA) – be subjected to an "orderly phase-down", beginning with a 25% budget cut; reasons given are that these efforts should be moved in-house for better DOD security control and to give the advisers the responsibility for acting on their advice.

1557. "Geneva Disarmament Conference Agrees on Draft Text of Bacteriological Weapons Convention", *U.S. Department of State Bulletin*, v. 65, no. 1688, 1 November 1971, pp. 504-510.

Presents a statement by Ambassador J. F. Leonard explaining principal changes from the August 5 draft (see U.S. Dept. of State Bull., v. 65, no. 1679, 30 Aug. 1971, pp. 221-226), e.g., broadening the scope of the preamble to include references to chemical weapons; presents the text of the revised Draft Convention.

1558. Nichols, R. W., "The Coming SALTing of Defense R&D", *Innovation*, no. 26, November 1971, pp. 46-57.

Discusses the changes in defense R&D that will result from arms-control talks such as SALT and the changing attitudes toward defense itself; states, as a reconciliation to extremist views on R&D, "Defense R&D should be managed to provide the *widest possible range of options* ... so as to ensure that *reliable choices* can be made about what our national security truly requires in the way of production and deployment".

1559. Willrich, M. (Ed.), *Civil Nuclear Power and International Security*, Praeger Special Studies in International Politics and Public Affairs, in

cooperation with the Center for the Study of Science, Technology and Public Policy, Praeger Publishers, New York/Washington/London, 1971, 124 pp. ($10.00)

Presents proceedings of a May 1970 conference of 18 individuals who assessed and evaluated thy international security problems anticipated because very large amounts of fissionable materials will become available in civil nuclear industries in a number of nations; papers are presented on the nature of the problem, international safeguards, and the international political context; appendixes give the texts of the nonproliferation treaty, the U.N. resolution on security assurances, and excerpts from a description of the international safeguards system.

1560. "Conflict Over Underground Nuclear Tests", *Science News*, v. 100, no. 19, 6 November 1971, pp. 307-308.

Describes the disagreement among scientists on the minimum magnitude of explosions which could be detected, a vital question in regard to enforcing a test-ban treaty if violations are to be detected by seismic signals; cites some evasion techniques that countries could possibly employ; briefly discusses U.S. tests and the controversy surrounding them.

1561. Mink, P. T., "The Cannikin Papers", *Congressional Record*, v. 117, no. 170, 10 November 1971, pp. H10887-10892.

Reprints a memorandum and portions of the Cannikin Papers, heretofore kept secret, warning of the dangers and risks both direct and indirect, that might be engendered by the powerful blast to be set off on Amchitka; denounces the administration for placing our people and those of other nations in such jeopardy.

NORTH VIETNAM

1562. Galston, A. W., and Signer, E., "Education and Science in North Vietnam", *Science*, v. 174, no. 4007, 22 October 1971, pp. 379-385.

Describes educational facilities and the commitment of the North Vietnamese to science education, mainly in the medical and health-care fields; describes characteristics of North Vietnamese scientific institutions and life style: self-reliance, responsible planning, concern for public welfare, and close interaction between science and society.

OCEAN – INTERNATIONAL ACTIVITIES

1563. "U.S. Draft Articles on Territorial Sea, Straits, and Fisheries Submitted to U.N. Seabeds Committee", *U.S. Department of State Bulletin*, v. 65, no. 1680, 6 September 1971, pp. 261-268.

Presents the transmittal statement of Legal Adviser J. R. Stevenson in submitting draft articles in Geneva on August 3, on the breadth of territorial sea, straights, and fisheries; reprints the text of the 3 draft articles and discusses each in detail.

1564. "Ocean Dumping: 12-Nation Agreement", *Chemical & Engineering*

News, v. 49, no. 50, 6 December 1971, p. 15.

Describes a draft agreement prepared at a 12-nation conference in Oslo, Norway, prohibiting the dumping of harmful materials into the Northeast Atlantic; if the governments of all participating countries approve the Oslo treaty, it could become effective during the first half of 1972.

1565. O'Connell, D. P., "Legal Problems of the Exploitation of the Ocean Floor", *Impact of Science on Society*, v. 21, no. 3, July-September 1971, pp. 253-264.

Describes the history of attempts to define the limits of the continental shelf, which mark the boundaries of areas subject to national sovereignties; discusses the difficulties of internationalizing the deep-sea bed (beyond the shelf); recommends establishing a single international body to regulate all aspects of the ocean, since navigation rights, pollution control, mineral exploitation, nuclear propulsion, marine ecology, and political security are inextricably interrelated.

OCEAN – POLLUTION

1566. *Ocean Waste Disposal*, Hearings before the Subcommittee on Oceans and Atmosphere of the Committee on Commerce, U.S. Senate, 92nd Congress, 1st Session, on S. 307, 1082, 1238, and 1286, 2-3 March and 15, 21-22, 28 April 1971, Serial No. 92-11, 1971, 340 pp. (Available from Committee on Commerce, U.S. Senate, Washington, D.C. 20510.)

Presents text and agency comments on 4 bills to regulate (and eventually prohibit) waste discharge in territorial and international waters and provide for R&D on use and disposal of such waste; reprints testimony by numerous witnesses and includes supporting documents to help Congress decide what regulatory measures are needed and how they should dovetail with existing agency programs.

1567. *Radioactivity in the Marine Environment*, Prepared by the Panel on Radioactivity in the Marine Environment of the Committee on Oceanography, Division of Earth Sciences, National Research Council, 1971, 272 pp. (Available as Report ISBN 0-309-01865-X from Printing and Publishing Office, NAS, 2101 Constitution Ave., N.W., Washington, D.C. 20418. Price: $12.50.)

Presents a review by 31 authors from the U.S., Canada, the U.K., and Monaco of the state of understanding of radioactivity in the sea – essentially updating a 1957 NAS-NRC report, *Effects of Atomic Radiation on Oceanography and Fisheries;* concludes that radioactivity in the sea is being kept well below concentrations considered harmful to man and other forms of life according to existing standards.

1568. *Conventions and Amendments Relating to Pollution of the Sea by Oil*, Hearings before the Subcommittee on Oceans and International Environment of the Committee on Foreign Relations, U.S. Senate, 92nd Congress, 1st Session, on Executive G, 91st Congress, 2nd Session, 20 May 1971, 229 pp. (Available from Committee on

Foreign Relations, U.S. Senate, Washington, D.C. 20510.)

Presents Testimony and supporting documents relevant to the 1969 IMCO oil pollution conventions and amendments before the Senate, aimed at authorizing coastal states to act against the threat of oil pollution from maritime accidents beyond their territorial seas, to provide an international legal standard of strict liability against owners of tankers involved in accidental oil spills, and to tighten up existing international regulations covering discharge of oil at sea.

1569. Teague, C. M., "A Slick Look at Santa Barbara", *Congressional Record*, v. 117, no. 137, 21 September 1971, pp. E9824-9825.

California's Rep. Teague discusses the need for a compromise to permit extraction of the several billion barrels of oil found in the Santa Ynes basin up the coast from Santa Barbara and away from the people, while terminating 35 leases seaward of Santa Barbara where no oil has been discovered; presents an article by legislative assistant C. Seeger explaining the history of the Santa Barbara legislation and outlining this compromise.

OCEAN – U.S. ACTIVITIES

1570. Hosmer, C., "Humanities of the Sea", *Congressional Record*, v. 117, no. 148, 6 October 1971, p. E10540.

Discusses the University of Virginia's new adult-education course in the Humanities of the Sea, cosponsored by the Oceanic Educational Foundation as part of a pilot research program to introduce oceanic education into the American school system; lists expected guest lecturers.

PAKISTAN

1571. *East Pakistan Land and Water Development as Related to Agriculture*, a report of an *ad hoc* Panel of the Board of Science and Technology for International Development of the National Academy of Sciences/National Research Council prepared for the Agency for International Development, January 1971, 67 pp. (Available within limits of supply from Office of the Foreign Secretary, National Academy of Sciences, 2101 Constitution Ave., N.W., Washington, D.C. 20418.)

Presents recommendations on the most effective ways to employ limited resources in improving food supplies and water management in East Pakistan; emphasizes broad aid in fertility control, agriculture, manpower development, institution building, food supply, and sectoral loans; cites East Pakistan as the first real test of "the commitment of the developed nations to the ideal of a humane world".

PERSONALITIES

1572. "Stever-NSF Nomination", *Science*, v. 174, no. 4011, 19 November 1971, p. 804.

Announces the White House nomination of H. Guyford Stever, president of Carnegie Mellon University, to succeed W. D. McElroy as director of the National Science Foundation in February, when McElroy leaves to become chancellor of the University of California at San Diego, gives Stever's background, including membership on the National Science Board, Defense Science Board, chief scientist (1955-56) for the U.S. Air Force, and 20 years on the faculty at M.I.T.

1573. "Gabor Strasser Named Director of Planning for Battelle-Columbus", *Battelle Press Release,* 13 October 1971, 3 pp. (Available from Publications Office, Battelle-Columbus, Columbus, Ohio 43201.)

Announces Battelle's hiring of Strasser, formerly Technical Assistant to Nixon's Science Adviser, to identify and assess national and international needs and trends, with special emphasis on science and technology, so that Battelle may better focus its resources to help solve existing problems; outlines Strasser's qualifications for the post.

1574. Shapley, D., "Magruder in White House: SST Man Plans New Technology Take-Off", *Science,* v. 174, no. 4007, 22 October 1971, pp. 386-389.

Explores the significance of the appointment of William M. Magruder as program manager in the White House; discusses his duties and his possible influence on U.S. R&D priorities; points out what his development of a good program will mean to American industry and to basic research.

1575. "Interior Secretary Rogers Morton: Truly a Practical Environmentalist", *Engineering News Record,* v. 187, no. 16, 14 October 1971, pp. 27-28.

Describes Interior Secretary Rogers Morton's background, personality, and pragmatic approach to environmental issues, including his views on the Alaskan pipeline (expects to approve it as soon as the oil companies present an acceptable plan).

PHILIPPINES

1576. Medina, F. A., "Quality Education in the Sciences", *Philippine Science Review,* v. 11, no. 6, November-December 1970, pp. 3-5.

Describes a national program in the Philippines aimed at science education improvement in all areas: modernization of education of teachers, development of science materials relevant to conditions in the Philippines, and conduct of research on teacher-learning processes; urges that the Asian Association for Biology Education reexamine the orientation of the biology courses presently offered in light of present needs and problems.

1577. "Solving the Brain-Drain", *Philippine Science Review,* v. 12, no. 1, January-February 1971, pp. 23-24.

Describes measures being taken by the National Science Development Board to recruit Filipino scientists and technical men for service in their country — chiefly the provision of work opportunities in scientific activities and research for those now in the

country and for those returning from abroad; lists the positions, classifications, and salaries for work with the NSDB.

1578. Afable, P. G., "Nuclear Science is Challenging in the Seventies", *Philippine Science Review*, v. 11, no. 3, May-June 1971, pp. 6-11.
Afable, Commissioner of the Philippine Atomic Energy Commission, describes the development of nuclear science and the many opportunities now existing for peaceful applications of nuclear energy in the Philippines.

POLICY MAKING BODIES

1579. "The Importance of William M. Magruder", *Nature*, v. 234, no. 5324, 12 November 1971, p. 60.
Describes Magruder's new position as the head of the Technological Opportunities Program; suggests that should Magruder fail to recognize that money limitations exist and that rationality must be exercised in the application of technology to practical problems, this program will fail as miserably as the SST.

POLLUTION – AIR

1580. Pitts, J. N., Jr., "Pollution and Politics: A Chemist's View", Speech presented at California Institute of Technology, 16 November 1971, *Congressional Record*, v. 117, no. 186(II), 2 December 1971, pp. E12868-12873.
Prof. Pitts, director of the University of California's Statewide Air Pollution Research Center, discuss the key role of science and scientists in the development and implementation of technological and societal options for air pollution control; states that it is the responsibility of individuals from industry, control agencies at all levels of government, and research scientists and engineers to work together to provide sound technical information on which to base effective legislative control strategies.

1581. Ortego, P. D., and Pinon, J. M., "Future Conditional: Biology and Politics of Air Pollution", *Ecology Today*, v. 1, no. 9, November 1971, pp. 30-33, 36.
Discusses the hitherto ignored important political and biological aspects of air pollution; demonstrates a direct link between air pollution, and disease; suggests five goals for individuals, including keeping air-pollution authorities free from political pressure, giving children environmental education, and making the voice of the public as vigorous as the voice of industry.

1582. *Annual Report of the Environmental Protection Agency to the Congress of the United States, In Compliance With Section 202(b)(4), Public Law 90-148, The Clean Air Act as Amended*, 9 July 1971, 6 Chapters. (Available from Public Affairs Office, EPA, Rockville, Md. 20852.)
Deals primarily with EPA's efforts related to the 1970 Amendments prescribing specific percentage reductions in emissions required in 1975 and 1976 automobiles; includes discussion of a

number of related programs; now under EPA, that had been under HEW as part of the National Air Pollution Control Administration.

POLLUTION – INTERNATIONAL COOPERATION

1583. *International Environmental Science*, Proceedings of the Joint Colloquium before the Committee on Commerce, U.S. Senate, and the Committee on Science and Astronautics, U.S. House of Representatives, 92nd Congress, 1st Session, 25 and 26 May, 1971, Serial No. 92-13, 241 pp. (Available from Committee on Commerce, U.S. Senate, Washington, D.C. 20510.)

Presents statements, testimony, articles, letters, and communications intended to shed light on the political and related problems involved and the international institutional structures needed to generate and utilize scientific information for formulating and implementing policies governing the relationship of man to his natural surroundings.

1584. Anderson, E. V., "Pollution Control: A World Trade Problem", *Chemical & Engineering News*, v. 49, no. 46, 8 November 1971, pp. 14-18.

Discusses the international economic, trade, and development problems which are brought on by environmental protection programs and legislation of separate nations; discusses problems stemming from lack of international standards for pollution control and suggests the institution of such standards.

1585. "Pollution – the Whole World's Problem", *Environmental Science & Technology*, v. 5, no. 9, September 1961, pp. 750-751.

Describes international efforts to deal with regional and global pollution problems, discusses various bilateral and multilateral cooperation efforts, the planned U.N. Conference on the Human Environment, and international activities of the Environmental Protection Agency.

1586. *The Human Environment: Science and International Decision Making*, A basic paper prepared for the Secretariat of the United Nations Conference on the Human Environment, by the International Institute for Environmental Affairs, based on a workshop co-sponsored with the Aspen Institute for Humanistic Studies, 31 pp. (Available from IIEA, 600 Fifth Ave., New York, N.Y. 10020.)

Presents some guiding principles for organizing environmental efforts at levels from local to global, analyzes the institutional implications inherent in the nature of global environmental problems, and identifies essential first steps for carrying out any significant Action Plan adopted by the Conference; describes the IIEA and lists its officers, members, and Workshop participants.

1587. *1972 Conference on the Human Environment*, U.S. Department of State Publication 8617, International Organization and Conference Series 98, Released November 1971. (Available from U.S. Department of State, Office of Media Services, Washington, D.C. 20520.)

Presents background and details of the U.N. Conference to be

held in Stockholm June 5-16, 1972, including who will attend, how the plans are being developed, organizational details, how the public is involved, how citizens may contribute, subjects of U.S. papers, and Advisory Committee membership.

1588. Goldman, M. I., "At World Conference on the Environment: Americans Spoke with the Radical Voices", *Congressional Record*, v. 117, no. 148, 6 October 1971, pp. S15936-15938.

Reviews pollution-control proposals made by different countries at one of the numerous international conferences held since June and the reactions to the steps that have already been taken, as well as to their beneficial and adverse consequences; describes the fears of developing countries that environmental control will hamper their economic growth.

1589. Leff, D. N., "A Meeting in Prague", *Environment*, v. 13, no. 9, November 1971, pp. 29-33.

Reports on the discussions held during the first international environmental meeting, convened last May by the U.N. Economic Commission for Europe, which reconfirmed that socialist states experience the same air and water pollution as advanced capitalist countries and that the same countermeasures are employed by both.

POLLUTION – NOISE

1590. *Noise Control*, Hearings before the Subcommittee on Public Health and Environment of the Committee on Interstate and Foreign Commerce, U.S. House of Representatives, 92nd Congress, 1st Session, on H.R. 5275, 923, 3364, 6002, 6986, 6988, and others, 16-17 and 22-24 June 1971, Serial 92-30, 504 pp. (Available from Interstate and Foreign Commerce Committee, U.S. House of Representatives, Washington, D.C. 20515.)

Presents the texts of a number of bills involving noise pollution and a report by EPA Administrator Ruckelshaus describing them, followed by statements of numerous witnesses and a mass of additional material submitted for the record; the objective is to provide a factual basis for writing comprehensive legislation dealing with all aspects of noise pollution and control.

1591. Patten, E. J., "The Problem of Noise Pollution", *Congressional Record*, v. 117, no. 184, 30 November 1971, pp. E12747-12748.

Reprints an article by Marilyn Ballas containing quotes on dangers of noise pollution by noted physicians and environmental scientists, one warning that in 8 years the noise-pollution situation will be the same as the present air- and water-pollution situation; presents some typical noise levels experienced today.

1592. Woodcock, L., "The Noise Around Us: Hazards and Cures", *Congressional Record*, v. 117, no. 144, 30 September 1971, pp. H8958-8960.

Describes the long-range effects of noise pollution on people, particularly the psychosomatic stresses; calls for more vigorous enforcement of the Occupational Safety and Health Act.

POLLUTION – PESTICIDES AND HERBICIDES

1593. "DDT Nailed Again", *Nature,* v. 233, no. 5318, 1 October 1971, pp. 299-301.

Presents the history of regulations to guard against the dangers of the pesticide DDT, and recommendations by a scientific advisory committee appointed by the Environmental Protection Agency, to the effect that the use of DDT be phased out but that it remain available for control of disease-bearing insects at least until satisfactory alternatives are found.

1594. "DDT May be Good for People", *Nature,* v. 233, no. 5320, 15 October 1971, pp. 437-438.

Points out flaws in the case against the use of DDT and related pesticides in agriculture, concluding that "it is important that the present wave of sentiment in favor of a ban on the use of DDT and such materials should be replaced by a proper and necessary case for regulation and supervision of the ways in which these pesticides are used".

1595. Ehrlich, P. R., and Holdren, J. P., "The Gypsy Moth Backlash", *Saturday Review,* 2 October 1971, p. 71.

Points out that the economic and ecologic damage caused by the gypsy moth appears worse than it is, and calls attention to the ineffectiveness and dangers of widespread use of persistent pesticides; recommends integrated control with nonpersistent pesticides, imported parasites and predators, and synthetic sex lures.

1596. Ehrlich, P. R., and Holdren, J. P., "Starvation as a Policy", *Saturday Review,* 4 December 1971, p. 91.

Criticizes the ecocide (deliberate destruction of ecosystems) conducted by the U.S. Military in Southeast Asia, and describes its dire consequences on the civilian population; cites the lobbying by the scientific community which forced the Military to stop using herbicides as an example of the positive role science can play in political decision-making.

1597. Humphrey, H. H., "The Geneva Protocol – II", *Congressional Record,* v. 117, no. 183, 29 November 1971, pp. S19685-19688.

Reprints an article from the October 10 *New York Times* by H. Mitgang and a statement from a report by Cornell's Center for International Studies which describe the use of herbicidal formulations such as the Blue, White, and Orange defoliants in Indochina; believes that the Geneva Protocol should ban herbicides and riot gases, and expresses concern over the U.S. leaving stocks of gases in Vietnam for use by the South Vietnamese Army.

1598. Pryde, P. R., "Soviet Pesticides", *Environment,* v. 13, no. 9, November 1971, pp. 16-24.

Discusses the concern of the Soviets over environmental problems caused by the use of various pesticides and herbicides; describes their efforts to fight the detrimental effects of these agents and to find suitable substitutes, comparing them with comparable

problems and programs in the U.S.

1599. San Clemente, C. L. (Ed.), *Environmental Quality: Now or Never*, Proceedings of a Summer Institute held 29 June-1 July 1970 at Michigan State University, SIM Special Publication No. 5, 1972, 320 pp. (Available from Continuing Education Service, MSU, East Lansing, Michigan 48823, Price: $3.00.)

Consists of papers by experts representing a wide range of disciplines covering recent man-made changes in the environment and possible ways of correcting these changes; divided into 6 sessions: I. Environmental Visions (7 papers), II. Ecology (6 papers), III. Problems – Answers (5 papers), IV. Water Treatment Innovations (5 papers), V. Multiple Complexities (5 papers), and VI. Positive Responses (6 papers).

POLLUTION – PROBLEMS AND CONTROL

1600. Murdoch, W. W. (Ed.), *Environment: Resources, Pollution & Society*, Sinauer Associates, Inc., 20 Second St. Stamford, Conn. 06905, 1971, 441 pp. ($5.95).

Discusses major environmental topics in 20 chapters, each by a different specialist, prepared as a textbook; grouped under 3 main subjects: (1) Population & Resources (man, food, minerals, energy, land, and water), (2) Environmental Degradation (air pollution, water pollution, ocean pollution, radiation, pesticides, and climate), and (3) Environment & Society (cities, economics, law, administration, and population); indexed.

1601. Commoner, B., "The Closing Circle", *Congressional Record*, v. 117, nos. 154 and 159, 15 October and 26 October 1971, pp. E10958-10966 and E11293-11301. (Reprinted from Sept. 25 and Oct. 2 *New Yorker*.)

Examines the nature of the earth's environment; Part 1 analyzes the 4 laws of ecology: everything is connected to everything else, everything must go somewhere, nature knows best, and there is no such thing as a free lunch; Part 2 presents a history of environmental problems in the U.S.; contends that "the world is being carried to the brink of ecological disaster . . . by a phalanx of powerful economic, technological, and social forces" and that to survive "we must learn how to restore to nature the wealth we borrow from it".

1602. Robinson, H. W., "The Politics of Ecology", *Congressional Record*, v. 117, no. 194, 11 December 1971, pp. E13331-13333.

Rep. Robinson presents two different newspaper articles reviewing Barry Commoner's "The Closing Circle", dealing with the emerging ecological crisis; labels Commoner's proposed solution "A complete reallocation of economic priorities and a complete political reorientation toward environmental goals", and takes issue with the need for such drastic measures.

1603. Commoner, B., "The Origins of the Environmental Crisis, Testimony at Senate Commerce Committee Hearing on Ocean Dumping, *Congressional Record*, v. 117, no. 194, 11 December 1971,

S21500-21507.

Discusses the population increase, economic growth, and the introduction of new technologies which generate more severe impacts as the underlying reasons for the environmental crisis; estimates that to survive economically and biologically, half of the productive enterprises developed since 1946 (about 600 billion dollars worth) will need to be replaced by ecologically sounder ones, which means that most of the nation's capital investment will have to go toward ecological reconstruction for at least a generation.

1604. **Butz, E. L.**, "Man and His Environment – Crisis or Challenge?", *Congressional Record*, v. 117, no. 186, 2 December 1971, pp. S20127-20129.

Gives reasons for the rising concern over environment, resource use, pollution, and quality of life, but warns against hasty action without evaluating the risk-benefit ratios; contends that we must decide how much we are willing to pay for a better quality of life, including population control, and take the risks involved in coping with the problems.

1605. **Tinker, J.**, "Cleaning Up America", *New Scientist and Science Journal*, v. 51, no. 770, 23 September 1971, pp. 679-681.

Discusses the 2nd annual report of the Council on Environmental Quality [*SPR* 4(3):1172] on progress in pollution control in the U.S.; compares U.S. environmental agencies, laws, and activities with those in the U.K.; reviews the CEQ data on the cost of pollution and its abatement and concludes that the sheer size of the U.S. and the heterogeneity of its pollution problems make it hard to know how the battle is going.

1606. **Hickel, W. J.**, "The Making of a Conservationist", *Saturday Review*, 2 October 1971, pp. 65-67.

The ex-Secretary of the Interior discusses various environmental problems, the role of the Federal government, and the importance of the individual in protecting the environment; recommends making an inventory of all U.S. resources as a tool for determining how they can best be used.

1607. **Neuhaus, R.**, "Not Nature Alone", *Congressional Record*, v. 117, no. 137, 21 September 1971, pp. E9808-9810.

Points out fallacies in popular features of the ecology movement: mislocation of ecological villians, polluters leading the anti-pollution crusade, escape to the wilderness, application of "triage" to set priorities for foreign aid, attempts to divorce the "new consciousness" from politics, and motivation through the concept of survival; recommends a U.S. "Covenant with the Poor", with 2% of the GNP going to underdeveloped countries with absolutely no military motives.

1608. **Harrison, G.**, "Making Peace with the Earth", *Saturday Review*, 6 November 1971, pp. 77, 82-85.

Discusses the basic changes necessary in the complex systems polluting this earth, and states that those changes will be initiated by "imperceptible shifts in direction"; expands on the

theme that the real task facing society is "not to get rid of pollution but to manage producing systems of all kinds so that they do not pollute".

1609. **Thring, M., "Pollution — a Call for Direct Action", *New Scientist and Science Journal,* v. 51, no. 769, 16 September 1971, pp. 637-639.**

Describes the discussions held in Trondheim by the British Society for Social Responsibility in Science on the effects of food pollution and radiation on human genetics and the problems of developing countries; presents two resolutions agreed upon at the Conference on immediate action that must be taken to reverse the coming ecological disaster.

1610. **"Uncle Sam's Lawyers, A Growing Force on the Pollution Scene", *Environmental Science & Technology*, v. 5, no. 10, October 1971, pp. 994-995.**

Discusses the increasing effectiveness of the environmental lawyer in enforcing environmental regulations; notes that water quality regulation is ahead of air pollution control because of stronger regulatory acts (the 1899 Rivers and Harbors Act and the Clean Air Act Amendments); describes the activities of the Environmental Protection Agency in enforcing these regulations.

1611. *Managing our Environment, a Report on Ways Agricultural Research Fights Pollution*, **Agricultural Information Bulletin no. 351 prepared by Agricultural Research Service, U.S. Department of Agriculture, April 1971, 49 pp. (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price: 75 cents.)**

Presents some major challenges facing scientists and regulatory officials working in agricultural research – protecting land, water, and waterways by properly managing farm wastes, recycling food processing wastes, fighting pests, and keeping the environment green.

1612. **Feinberg, G., "Long-Range Goals and the Environment", *The Futurist*, v. 5, no. 6, December 1971, pp. 241-246.**

Discusses the distinction between questions concerning unintentional environmental change and those concerning intentional change; believes that an appreciation of these distinctions is essential for rational discussion of whether an environmental crisis exists and, if so, how to deal with it; proposes "that the human race attempt collectively to define its long-range goals" to establish a sounder basis for making decisions about future scientific developments.

POLLUTION – RADIATION

1613. **Davy, D. R., *Nuclear Power and Environmental Pollution*, Preprint for 43rd ANZAAS Congress, Brisbane, 1971, Australian Atomic Energy Commission, Research Establishment, Lucas Heights, Sutherland, 2232, N.S.W. (Available in the U.S. as Report NP-18842 from National Technical Information Service, Springfield, Va. 22151, for $3.00; outside the U.S., inquire from the AAEC.)**

Analyzes the potential of certain activities (e.g., uranium mining, fuel reprocessing, spent fuel transportation, and reactor operations) to produce radioactive pollution; concludes that radioactive discharges produce only limited pollution that can be reduced to any level by capital expenditure; discusses cost-benefit factors.

POLLUTION – WASTES

1614. *Bulletin of the National Center for Resource Recovery, Inc.*, v. 1, no. 1, October 1971, 20 pp. (Available from the Center, 1211 Connecticut Ave., N.W., Washington, D.C. 20036.)

Presents solid-waste information; lead article is a detailed survey of the state-of-the-art of resource recovery, including waste recycling; next is an analysis of the potential wealth that could be extracted from municipal trash piles based on current techniques; "Incentives for Reuse and Disposability", by R. L. Lesher, outlines the Center's goals and programs; biosketches are presented of Center President Lesher, Director of Research J. G. Abert, and Director of Information W. St. Clair.

1615. *Let's Talk About Trash.* (Brochure available from National Center for Resource Recovery, Inc., 1211 Connecticut Ave., N.W., Suite 800, Washington, D.C. 20036.)

Presents answers to frequently asked questions regarding solid waste, grouped according to four main areas: what solid waste is, how to dispose of it, some basic facts about Resource Recovery Center, and what can be done about solid wastes.

1616. "Preserve the Underground", *Chemical & Engineering News*, v. 49, no. 51, 13 December 1971, p. 7.

Discusses the growing concern of ecologists over the increasing injection of wastes in the subsurface space, and advances two possible results of this waste disposal: damage to underground aquifers and irreversible damage to the natural cleansing power of subsurface rock and soil.

1617. Price, R., "National Symposium on Animal Waste Management", *Congressional Record*, v. 117, no. 158, 21 October 1971, pp. E11260-11262.

Presents the final report of the National Symposium on Animal Waste Management; includes evaluation of current technical and financial assistance programs and extension services to farmers facing economic and technical problems in adjusting to animal waste management regulations; presents specific recommendations in the areas of problem definition, coordination of efforts, technical assistance, financial assistance, education, and R&D.

POLLUTION – WATER

1618. Harsha, W. H., "A Comprehensive Water Quality Program for the Seventies", *Congressional Record*, v. 117, no. 136, 20 September 1971, pp. H8586-8587.

Rep. Harsha proposes that the U.S. commit itself to a "broadly based, soundly conceived, comprehensive water quality control program" that would attack both municipal and industrial water pollution and accelerate watershed development; calls for the government to provide at least 65% of the $4 billion annual cost of new waste treatment facilities, watershed developments, planning, research, and demonstration.

1619. **Kemp. J. F., "Environmental Problems and Detergents",** *Congressional Record,* **v. 117, no. 163, 1 November 1971, pp. H10213-10219.**

Discusses the conclusions reached jointly by the Council on Environmental Quality and the Environmental Protection Agency regarding health and environmental problems associated with detergents; presents a number of statements and letters by residents of New York State concerning water pollution – primarily phosphates – and the Great Lakes.

1620. **Kluczynski, J. C., "Phosphorus in Detergents",** *Congressional Record,* **v. 117, no. 158, 21 October 1971, pp. H9929-9931.**

Rep. Kluczynski criticizes the Surgeon General's recommendation that consumers resume using phosphate detergents because of hazards involved with some nonphosphate detergents; presents statements by Environmental Commissioner H. W. Poston and Mayor R. J. Daley on the harmful effects of phosphates and what Chicago is doing to deal with the problem, concluding that phosphate detergents should be banned and that nonphosphates should be labeled as to content and first-aid procedures in the event of misuse.

POPULATION

1621. *Population Growth and America's Future,* **Report of the Commission on Population Growth and the American Future, 16 March 1971, 6 pp.** (Available from Planned Parenthood – World Population, 513 Madison Ave., New York, N.Y. 10022.)

Questions whether we should invest our resources to provide the increased services and facilities demanded by an increased population or concentrate on improving the quality of those existing; describes the adverse impacts of population growth on resources and environment, the economy, government, and society; states that the best "national population policy would be one that serves the general welfare by promoting informed individual choice".

1622. **Miles, R. E., "Three Ways to Solve the Population Crisis",** *The Futurist,* **v. 5, no. 5, October 1971, pp. 200-204.**

Discusses three possible ways in which population could be reduced: through some catastrophe, through self-regulatory gradual transition to zero population growth, and through a voluntary decrease in fertility rates for assorted reasons.

1623. **Kiefer, D. M., "On the Road to ZPG",** *Chemical & Engineering News,* **v. 49, no. 50, 6 December 1971, pp. 20-22.**

Suggests that the U.S. is edging toward zero population growth, and presents reasoning indicating that it will not be reached before the 21st century; discusses some effects (not necessarily bad) ZPG would have on business, and some problems it would introduce.

1624. **"Population Stabilization: Testimony of Leonard Lee Lane"**, *Congressional Record*, v. 117, no. 156, 19 October 1971, pp. S16248-16249.
Lane, Associate Political Director of Zero Population Growth, calls for implementation of the population education features of the Environmental Education Act, P.L. 91-516, as a prerequisite for voluntary population stabilization; criticizes "Administration indifference, or hostility, to environmental education", particularly for failure to appropriate authorized funding and for failure of the Office of Education to support any population education.

1625. **Casserly, B., "Minus 'ZPG' Next?"**, *Congressional Record*, v. 117, no. 169, 9 November 1971, p. E12039.
Questions the advisability of adopting zero population growth as a national policy, and suggests, instead, directing attention to solving the real problems of food supply, transportation, marketing, and storage.

1626. **Chedd, G., "Some are Paying Heed"**, *New Scientist and Science Journal*, v. 51, no. 769, 16 September 1971, pp. 634-636.
Describes the circumstances that led Paul Ehrlich to write *The Population Bomb;* quotes Ehrlich's criticism of the U.S. Department of Agriculture and the suggestion that the Government put 5 times as much money and energy into agriculture and disease control for the next 20 years; discusses size of the organization, Zero Population Growth (ZPG), and points out that when things get bad enough it will be easy to get 10 million people in the U.S. really concerned with ecological cleanup.

1627. **Jaffee, F. S., "Toward the Reduction of Unwanted Pregnancy"**, *Science*, v. 174, no. 4005, 8 October 1971, pp. 119-127.
Assesses public and private family planning programs and describes the basic factors shaping them; cites adverse consequences of unwanted pregnancies; discusses current efforts and offers suggestions regarding the approach national policy and programming should take, including expansion of educational programs, removal of policy and cultural barriers, improvement of contraceptive technology, and creation of an adequate network of planning services.

PRIORITIES FOR R&D

1628. **"Nixon Aides Searching for Nixon Program"**, *Washington Science Trends*, v. 26, no. 25, 27 September 1971, pp. 147-148.
Describes Federal efforts to find new programs which would ensure the "maximum enhancement" of U.S. technologies in meeting the challenges of peace; quotes Magruder's appeal for suggestions on stimulating innovation in the civilian sector with

cost-beneficial programs relating to national problems or providing potential for economic growth, increased exports, or technological leadership.

1629. Ayres, R. U., "Government Policy and Prospects for Technology-Based Industry", *Professional Engineer*, v. 41, no. 12, December 1971, pp. 38-41.

Criticizes U.S. Government policy in cutting back funds to smaller R&D firms for developing advanced concepts while continuing to support large existing DOD, NASA, and AEC programs that have reached advanced development; contends that this policy must be changed if the U.S. is to maintain its economic and technological lead.

1630. *Environmental Science: Challenge for the Seventies*, Report of the National Science Board, National Science Foundation, 1971, 50 pp. (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price: 40 cents.)

Reviews the history of environmental science and the tools for its study, concluding that because of the extreme complexity of the natural environment, today's measurement and observation techniques cannot supply the data, interpretations, and predictions needed by society; reviews U.S. resources for environmental science, and offers specific recommendations concerning a national program, priorities, organization, funding, and manpower development for environmental science.

1631. Mansfield, M., "Expenditures for 'Think Tanks' ", *Congressional Record*, v. 117, no. 165, 3 November 1971, pp. S17522-17525.

Deplores the distribution of R&D money by the Defense Department to universities and think tanks such as Rand; reprints two articles in the same vein, one citing, in contrast, the low funding for research on cancer, drug abuse, and arms control and disarmament, and the other citing the noncreative role of think tanks and the danger posed by the secrecy surrounding them.

1632. "Productivity and the RANN Program", *SPPSG Newsletter*, v. 2, no. 10, December 1971, pp. 14-17.

Presents excerpts from an address by A. J. Eggers, Jr., of the National Science Foundation, describing the major elements of the RANN program and stressing its overall goal: to promote civilian-sector research from an economic growth and productivity point of view; lists the general criteria for determining RANN's problem-oriented research efforts.

1633. Gwynne, P., "Wiesner in MIT's Hot Seat", *New Scientist*, v. 52, no. 773, 9 December 1971, p. 108.

Describes scientists' recent questioning of their role in society; discusses the problems facing J. Wiesner, the new president of MIT, stemming from budget cuts and the public's questioning of MIT's work.

PUERTO RICO

1634. "Puerto Rico to be the Site of International Marine Laboratory",

Press Release, 3 pp. (Available from Curtis J. Hoxter, Inc., 745 Fifth Ave., New York, N.Y. 10022.)

Announces the establishment of the Puerto Rico International Undersea Laboratory (PRINUL) sponsored by the Industrial Development Company (PRIDCO) and the Marine Resources Development Foundation (MRDF), for multidisciplinary research and training programs directed toward coastal zone management and environmental protection.

SCIENCE POLICY STUDY ORGANIZATIONS

1635. *SPPSG Newsletter*, published ten times yearly by the MIT Press. (Available by subscription from The MIT Press, 28 Carleton St., Cambridge, Mass. 02142. Price: $10/year for individuals; $25/year for institutions.)

Presents articles on science policy news items prepared for the Science and Public Policy Studies Group by qualified analysts and officials; "Congressional Roundup" describes recent *Congressional Record* entries related to science and public policy; other features are summaries of relevant theses and research programs, publications, announcements, and a job information exchange.

1636. "SPPSG is Incorporated", *SPPSG Newsletter*, v. 2, no. 8, October 1971, pp. 27-28.

Announces incorporation of the Science and Public Policy Studies Group in the State of Delaware as a non-profit institution comprising over 600 individual members and about 90 affiliated universities; for information about SPPSG and its *Newsletter*, write SPPSG, Room E53-450, MIT, Cambridge, Mass. 02142.

1637. *International Commission for Science Policy Studies*. Press notice, 22 December 1971, 2 pp. (Address inquiries to Dr. D. J. de S. Price, 2036 Yale Station, New Haven, Conn. 06520.)

Announces formation of the Commission by action taken at the International Congress for the History of Science in Moscow last August; objectives are to study "theoretical problems of science development and theoretical foundations of the organization and management of scientific activity including the study of logical, psychological, social, economic, structural and organizational problems"; lists the 5 officers and 14 members of the Commission; representing 13 countries, 6 of which are in the Soviet Bloc.

1638. Wright, D., "Prospects for the Study of Science in Human Affairs", *SPPSG Newsletter*, v. 2, no. 9, November 1971, pp. 4-7.

Comments on implications of the termination of Harvard's Program on Technology and Society and Columbia's Institute for the Study of Science in Human Affairs; points out "overriding institutional problems" (limited University resources, constant need for accommodation and compromise, diversity of views on interdisciplinary studies) that contributed to Columbia's decision; enumerates other obstacles (poor state of needed documentation,

lack of systematic definition of the field, dearth of qualified social scientists for such study) and suggests that the key may be "voluntary extracurricular" study.

1639. Folk, H., "Science and Public Policy at the University of Illinois", *SPPSG Newsletter*, v. 2, no. 7, August-September 1971, pp. 19-22.

Traces the history of generally unsuccessful attempts to institute broad-scale, continuing programs in science and public policy at both the Chicago Circle and Champaign-Urbana campuses.

1640. Denny, B. C., "Science and Public Policy at the University of Washington", *SPPSG Newsletter*, v. 2, no. 7, August-September 1971, pp. 16-19.

Describes UW's interdisciplinary educational offerings related to science and public policy, including seminars on Natural Resources Public Policy (11th year offered), Science and Public Policy, American Foreign Policy, Development of Human Talent, Social Management of Technology, Marine Technology Affairs, and Social Policy Analysis; announces plans for an NSF-funded project, Social Management of Technology.

1641. Coates, V. T., "George Washington University", *SPPSG Newsletter*, v. 2, no. 8, October 1971, pp. 9-11.

Reviews recent and current activities of the Program of Policy Studies (PPS), including enumeration of publications [most cited in *SPR* 4(2): Refs. 484, 583, 607, 851, 852, 853, 856, and 859], NSF contracts and grants, and graduate courses and curricula in science, technology, and public affairs.

1642. "Expansion of Program at Woodrow Wilson International Center for Scholars", *SPPSG Newsletter*, v. 2, no. 7, August-September 1971, pp. 22-24.

Announces the addition of peace and world order studies to the Center's present areas of concentration (ocean affairs and environmental problems); lists 16 current appointees and their areas of activity.

SOCIETY-SCIENCE INTERACTION

1643. Skolimowski, H., "Towards a Humanistic Technology", *Research Management*, v. 14, no. 5, September 1971, pp. 10-23.

Categorizes the approaches to technology into three classes — pragmatic, intellectual, and dialectical — and discusses and compares them; concludes that the type of technological knowledge required for society's needs will not emerge by itself, but will have to come from humanistically oriented technologists who choose to practice a new, "humanistic technology".

1644. Ravetz, J. R., "Towards Critical Science", *New Scientist and Science Journal*, v. 51, no. 770, 23 September 1971, pp. 681-683.

Defines "critical science" as research involving "the different sorts of damage inflicted on man and nature by runaway technology, followed by their public exposure and campaigns for their abolition"; discusses political, economic, and social aspects of this emerging field and its potential for overcoming "the

opposition between scientific knowledge and human concerns"; taken from Ravetz's new book, *Scientific Knowledge and its Social Problems*, Clarendon Press, 1971 (£5.00).

1645. **Shils, E., "Anti-Science", *Minerva*, v. 9, no. 4, October 1971, pp. 441-450.**

Analyzes editorially the current anti-science attitudes, brought on by the indifference of scientists to how their results were used and the concessions of the scientific establishment to the wishes and policies of those in positions of power, and reinforced by criticism from the New Left; discusses the positive aspects of scientific efforts, rationalizing the recent reduction in R&D funding and calling for new attitudes of scientists toward themselves and the consequences of their developments.

1646. **"Has Science Never Had It So Good?", *Nature*, v. 233, no. 5316, 17 September 1971, pp. 169-172.**

Reports on comments delivered by participants in the Roche Jubilee Symposium, "The Challenge of Life — Biomedical Progress and Human Values", held in Basle 31 August - 3 September, dealing with the conflict between science and society, genetic manipulation, aging, population, communication by scientists, the "right to health", and integration of the life sciences with the social sciences.

1647. **Meyers, D. W., "Organ Transplantation and the Law", *Impact of Science on Society*, v. 21, no. 3, July-September 1971, pp. 223-232.**

Discusses the questions of (1) who can consent to donate a living donor's organ and to what degree of bodily intrusion may he consent?; (2) when has death occurred so the organ may be legally removed from a cadaver donor?; and (3) who shall be chosen among the ailing multitudes to benefit from scarce and expensive transplantation skills and facilities?

1648. **Brooks, H., "Can Science Survive in the Modern Age?", *Science*, v. 174, no. 4004, 1 October 1971, pp. 21-29.**

Discusses the trends operating against science today including: public disenchantment with science, increasing feeling among scientists that the edifice of science is complete, and the demand that science always be relevant; points out that science is necessary for a strong economy, a livable environment, and a tolerable society, and that it must respond to new social priorities if it is to survive.

1649. **Mellanby, K., Price, T., and Ravetz, J. R., "Conflicts of Loyalty in Science", *Nature*, v. 234, no. 5323, 5 November 1971, pp. 17-21.**

Discusses the conflicting loyalties imposed on scientists through their employment by government, industry, or universities; describes the new scientific conscience and new style of science emerging in response to social conditions and problems of industrialized science and technology; states that scientists' basic loyalties should be to humanity.

1650. **Anderson, C. A., "U.S. Technology is Threatened: Curbing R&D Cripples Progress", *Congressional Record*, v. 117, no. 147, 5 October 1971, p. E10497.**

Anderson, President of Stanford Research Institute, discusses the problem of the long-range threat to U.S. technological affluence by the current curb on R&D, the effect of the Vietnam war on R&D, and the need for a rational national science policy.

1651. **Handler, P., "'n Defense of Science – The End and the Beginning", Speech before the Iron and Steel Institute, 26 May 1971, *Vital Speeches of the Day*, v. 37, no. 23, 15 September 1971, pp. 715-720.**

Presents strong arguments in rebuttal to charges against science, and maintains that science is vitally needed to solve the many problems of today and of the future; warns of the results of Government failure to provide leadership in scientific endeavors and of the neglect of science in general.

1652. **Bartley, R. L., "When Science Tangles with Politics", *Congressional Record*, v. 117, no. 151, 12 October 1971, pp. S16173-16174.** (Reprinted from Oct. 12 *Wall Street Journal.*)

Deals with issues raised by a report of the Operations Research Society of America based on a 21-month study of one aspect of the 1969 Safeguard debate, and suggesting that scientists recognize their true role in public policy, avoid reasoning based on politically partisan arguments, and "scrupulously guard a certain minimum of detachment and self restraint".

1653. **Freeman, C., et al., "The Goals of R&D in the 1970s", *Science Studies*, v. 1, nos. 3/4, October 1971, pp. 357-406.**

Briefly discusses the R&D goals in the 1950's and 1960's, and the scale and trend of R&D expenditures in relation to the broader issues of policy; concludes that "the advance of science and technology must find its support and its justification, not merely in expectation of competitive advantage, . . . but far more in its contribution to social welfare", and that the greatest challenge lies in the application of the results of research.

1654. **"The Demonism of Technology", *Innovation*, no. 26, November 1971, pp. 59-60.**

Presents the reasons advanced by Dennis Wrong, a sociology professor, for rising opposition to technology, and calls for pollution and population controls.

1655. **Burnet, M., "After the Age of Discovery", *New Scientist*, v. 52, no. 773, 9 December 1971, pp. 96-100.**

Presents an extract from Burnet's recently published book, *Dominant Mammal*, contending that the "age of Scientific Discovery" is over and that 99% of the scientific generalizations that bear on human affairs have already been made; discusses what this means for the future of science and the scientist.

1656. **Tribe, L. H., "Towards a New Technological Ethic: The Role of Legal Liability", *Impact of Science on Society*, v. 21, no. 3, July-September 1971, pp. 215-222.**

Discusses the social and ethical significance of the concept that the purveyors of technology should be legally responsible for any harmful consequences of their developments, whether such consequences were foreseeable or not.

1657. Potter, V. R., "Bioethics", *BioScience,* v. 21, no. 21, 1 November 1971, p. 1088.

Suggests the creation of a new discipline Bioethics, because "if the scientist is to regain any sense of dignity and worth, and if this planet is to remain inhabitable, it will be necessary for the scientific community to devote a much greater share of its time to treating human value judgements in the Man/Earth relationship as another branch of knowledge that is just as amenable to a rational approach as any other branch of knowledge."

SPACE – COMMUNICATIONS SATELLITES

1658. Feldman, N. E., and Kelly, C. M., "The Communication Satellite – A Perspective for the 1970s", *Astronautics & Aeronautics,* v. 9, no. 9, September 1971, pp. 22-29.

Outlines the present status of communications satellites and discusses competing products (such as cable TV) which will keep these satellites from achieving their true potential; calls for major new investments in R&D ($200 million per year) and new international arrangements to support communications satellite development toward new services and drastically reduced costs, in order to yield a profitable multibillion-dollar industry that can promote world understanding.

1659. Pepin, E., "Space Law (II): Legal Aspects of Direct Broadcasting by Satellite", *Impact of Science on Society,* v. 21, no. 3, July-September 1971, pp. 243-251.

Discusses difficulties that might stem from direct broadcasting of television programs from satellites to homes if such programs crossing national borders are used for propaganda, advertising, or for purposes that infringe on national sovereignty; points out the need for a general legal test covering such matters.

1660. "Definitive Intelsat Agreements Signed at Washington", *U.S. Department of State Bulletin,* v. 65, no. 1682, 20 September 1971, pp. 303-304.

Announces the signing on 20 August of new agreements by the U.S. and 53 other countries that will result in a new, permanent, 80-nation Intelsat (International Telecommunications Satellite Organization), to replace the interim Intelsat established in 1964 and managed by Comsat (Communications Satellite Corp.); includes a speech by Secretary Rogers outlining the worldwide beneficial implications of the agreements.

1661. "The Aerosat Controversy", *Aviation Week & Space Technology,* v. 95, no. 19, 8 November 1971, p. 9.

Presents an analysis of the widespread disagreement among the airlines and Government agencies on how best to improve air-traffic communications over the Atlantic and Pacific through the use of satellites, and warns of consequences for the airlines.

1662. Klass, P. J., "Aerosat Specifications Delineated", *Aviation Week & Space Technology,* v. 95, no. 15, 11 October 1971, pp. 53-54.

Discloses tentative performance specifications for the joint

U.S./European aeronautical satellite; confirms that White House approval is being sought regarding FAA's request to own half of the Aerosat system, in partnership with ESRO, instead of leasing service from a commercial company.

1663. Johansen, K., "U.S. Assures Europeans of Satcom Launch", *Aviation Week & Space Technology*, v. 95, no. 19, 8 November 1971, p. 23.

Describes a new U.S. policy recently announced by the State Department, under which an international system competitive with Intelsat is no longer opposed; also, U.S. launching of commercial European satellite systems is no longer contingent upon Europe's collaboration with the U.S. on space projects; outlines the U.S. position on launch of a European system under three possible situations.

SPACE – INTERNATIONAL COOPERATION

1664. Emme, E. M., *Statements by Presidents of the United States on International Cooperation in Space, A Chronology: October 1957-August 1971*, Prepared for the Committee on Aeronautical and Space Sciences, U.S. Senate, 24 September 1971, 126 pp. (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price: 55 cents.)

Quotes formal writings and speeches of U.S. Presidents Eisenhower, Kennedy, Johnson, and Nixon relating specifically to international aspects of space; gives the background for each administration and includes the context in which each statement was made; indicates unanimous executive agreement that space research and exploration should be an international undertaking.

1665. "Space Cooperation: A Long Road in Small Steps", *Astronautics & Aeronautics*, v. 9, no. 9, September 1971, pp. 8-11.

Describes the requirements for effective international cooperative science programs, as outlined by A. Frutkin, NASA's Assistant Administrator for International Affairs, and by E. E. David, Nixon's science adviser; presents a history of NASA's international activities and describes the recent U.S.-USSR cooperation in manned space flight docking.

1666. Logsdon, J. M., and Hanessian, J., Jr., "Earth-Resource Surveys – An International Framework Begins to Develop", *Astronautics & Aeronautics*, v. 9, no. 9, September 1971, pp. 30-35.

Describes activities over the past year in preparation for international participation in the first Earth-Resources Survey (ERS) missions next spring; discusses bilateral relationships between the U.S. and Brazil, Mexico, Canada, and the USSR, with emphasis on the latter's own ERS program and the joint U.S.-USSR Working Group on the Natural Environment that was formed to study the possibility of doing coordinated research; discusses the United Nations role and its ERS working group which is preparing to deal with the many policy questions expected, such as ownership and dissemination of economically valuable data obtained by ERS, and territorial sovereignty.

1667. Gerard, M., "IAF Gains UN Observer Status", *Astronautics & Aero-*

nautics, v. 9, no. 10, October 1971, p. 16.

Announces the granting of the International Astronautical Federation observer status with the Scientific and Technical Subcommittee of the U.N. Peaceful Uses of Outer Space Committee; announces Committee endorsement of a Draft Convention on International Liability for Damage Caused by Space Objects.

1668. Zhukov, G. P., "Space Law (I): The New Extra Terrestrial Jurisprudence", *Impact of Science on Society*, v. 21, no. 3, July-September 1971, pp. 233-241.

Calls attention to the necessarily rapid development of international space law covering such items as the altitude to which a State can claim sovereignty, the legal status of the moon, transfer of microorganisms from one planet to another and existing international agreements; discusses future directions of space law dealing with the rescue of astronauts, liability for harmful consequences of space activities, and the use of satellites and permanent space stations.

1669. "U.S. — Europe Space System Talks Center on Shuttle, Tug, Station", *Aviation Week & Space Technology*, v. 95, no. 20, 15 November 1971, p. 21.

Discusses plans for a joint U.S-European space system and goals of the system, including a space shuttle, the tug for transportation from near earth to synchronous orbits, a space station, a research applications module (RAM), and various payloads.

1670. "Martian Accord", *Nature*, v. 233, no. 5322, 29 October 1971, p. 583.

Discusses the further cooperation in space between the U.S. and Soviet Union which may evolve from the simultaneous arrival in orbit around Mars of NASA's Mariner-9 and the USSR's Mars 2 and 3 probes.

1671. Causse, J.-P., "Europe's Space Cooperation", *Astronautics and Aeronautics*, v. 9, no. 11, November 1971, p. 63.

Discusses European space cooperation and its ineffectiveness because of its lack of coordination; suggests the merger of all European space activities into a "real European space community".

1672. Fink, D. E., "Failure Clouds European Launcher Future", *Aviation Week & Space Technology*, v. 95, no. 20, 15 November 1971, pp. 20-21.

Describes the sixth consecutive failure in the Europa 1-2 launcher development program and the effect this failure may have on the advanced Europa 3 project currently funded by France, Germany, and Belgium as a special project with the European Launcher Development Organization (ELDO).

SPACE — PROGRAMS AND GOALS

1673. *United States Space Science Program*, Report to COSPAR, Fourteenth Meeting, Seattle, Wash., June 1971, submitted by Space

Science Board, 1971, 230 pp. (Available within limits of supply from National Academy of Sciences/National Research Council, 2101 Constitution Ave., N.W., Washington, D.C. 20418.)

Outlines the 1970 organizational changes, facilities for space research in the U.S., and international cooperative activities; summarizes observations from spacecraft, sounding rockets, high-altitude balloons, and aircraft during 1970, as well as plans for 1971 – grouped under relevant disciplines (stellar astronomy, solar astronomy, lunar and planetary research, particles and fields, upper atmosphere physics, earth sciences, and life sciences; Appendix contains an extensive bibliography of 1970 publications arranged by subject, and tables of 1970-71 spacecraft and sounding rocket launchings.

1674. *The National Space Program — Present and Future*, A compilation of papers prepared for the Subcommittee on NASA Oversight of the Committee on Science and Astronautics, U.S. House of Representatives, 91st Congress, 2nd Session, Serial U, 10 December 1971, 246 pp. (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price: $1.00.)

Presents a number of statements by distinguished representatives from Government, the aerospace industry, and the academic community dealing with what the objectives of the U.S. national space program should be during the next decade and the level of funding that would be needed to support a program calculated to achieve those objectives; statements deal with many aspects of the NASA program and many agree that a vigorous aeronautics and space effort is in the National interest, and that a revitalized space program is necessary if the U.S. is to retain its technological preeminence in the future.

1675. *Outer Planets Exploration, 1972-1985*, Space Science Board, National Research Council, National Academy of Sciences, 1971, 39 pp. (Available from Space Science Board, 2101 Constitution Ave., N.W., Washington, D.C. 20418.)

Builds on 4 Space Science Board studies since 1965, reassesses priorities within the outer planets portion only, and makes specific recommendations for a balanced program of outer solar system exploration combining TOPS Grand Tour with the more intensive study of Jupiter and Saturn by means of flybys, probes, and orbiters; suggests R&D areas that should be given priority by NASA toward these and future goals.

1676. Logsdon, J. M., "Shall We Build the Space Shuttle?", *Technology Review*, v. 74, no. 1, October/November 1971, pp. 49-57.

Describes NASA's program to develop a reusable system for transporting payloads to and from earth orbit — the aerospace industry's "only big-money, non-military, high-technology program on the horizon"; reviews impartially the technological, economic, and political issues involved in determining whether or not the program will be approved.

1677. Ulsamer, E., "The Shuttle: US's Airline into Space", *Air Force Magazine*, v. 54, no. 9, September 1971, pp. 53-61.

Reports on an interview with Dr. James C. Fletcher, new head of NASA, where he described methods for development of the space shuttle, phased or concurrent, and its possible configurations and payloads; discusses the shuttle's justification and advantages, and the program organization and FY 1972 funding ($115 million).

1678. **Strickland, Z., "Foreign Astronauts May Help Man U.S. Spacecraft in Mid-1970s",** *Aviation Week & Space Technology*, **v. 95, no. 14, 4 October 1971, pp. 19-20.**

Discusses the possibility of foreign astronauts being crew members on surplus Apollo spacecraft flown on as-yet-undefined missions between the end of the Skylab programs in 1973 and the start of horizontal shuttle flights in 1976; anticipates that about half the missions of the space shuttle will be flown for the Defense Department, 25-35% for NASA, 10-20% for European countries, and 5% for European/Asian scientific missions.

1679. **Sterling, C., "Seeing the Whole World – Remote Sensing at 492 Miles Up",** *Congressional Record*, **v. 117, no. 152, 13 October 1971, pp. E10781-10782.** (Reprinted from Oct. 12 *Washington Post.*)

Describes capabilities of the Earth Resources Technology Satellite, ERTS-A (not yet launched), primarily its remote-sensing features capable of taking an inventory of the planet; suggests some possible spin-offs from this program.

STATE SCIENCE ACTIVITIES

1680. **Haskell, E. H., "State Governments Tackle Pollution",** *Environmental Science & Technology*, **v. 5, no. 11, November 1971, pp. 1092-1097.**

Discusses the steps several states are taking for environmental protection through revising present departments or creating new ones, and the benefits derived – among them, provision of a stronger political base for environmental efforts, and increased administrative efficiency.

1681. *Tech News Hawaii*, **Newsletter of the Department of Planning and Economic Development, published by the Hawaii Technological Information Center, DPED, P.O. Box 2359, Honolulu, Hawaii 96804.**

Presents news related to science and technology in Hawaii; e.g., v. 4, no. 1 (November 1971) announces new priorities for the Information Center (HAWTIC) on marine affairs, establishment of the Center for Science Policy and Technology Assessment within the DPED, seminars on solid wastes and on finance and accounting, new HAWTIC personnel, and data search capabilities.

SWEDEN

1682. **Jamison, A., "The Lesson of the Asko Lab",** *New Scientist*, **v. 52, no. 773, 9 December 1971, pp. 78-80.**

Describes the efforts of a group of Swedish scientists to develop a systematic model of the Baltic ecosystem with a base on the island of Asko; discusses the lessons learned from this project, an

important one being "that if change is going to come in the way that industrialized societies interact with their natural environments, the change will not come from the governmental authorities. It will come from the scientists".

SWITZERLAND

1683. *Embassy of Switzerland Bulletin*, published triannually by the Office of the Scientific Attaché to the Swiss Embassies in Washington, D.C., and Ottawa, Canada. (Inquiries regarding availability may be addressed to Mr. G.-A. Grin, Scientific Attaché, Embassy of Switzerland, 2900 Cathedral Ave., N.W., Washington, D.C. 20008.)

Contains current science policy information, much of which is of general interest, directed toward Swiss workers in the U.S. and Canada; a typical issue contains about 120 pages and includes material headed Editorial, the Reader's Mind, National and International Problems, Science Policy, Economy, R&D, Education, Miscellaneous, Academic Appointments, Cultural News, and Open Positions; latest is v. 11, no. 3, November 1971.

1684. "Swiss Research, from University to Industry", (in French), *La Recherche*, no. 17, November 1971, pp. 911-913.

Consists of a question-answer interview of Prof. A. Cerletti, Deputy Chairman of the Swiss Federal Science Council and Director of Basic Medical Research for Sandoz Pharmaceuticals, who explains the objectives of the Swiss Federal scientific program and its importance to industry.

TECHNOLOGICAL FORECASTING

1685. Martino, J. P., "Computers and Technological Forecasting", *The Futurist*, v. 5, no. 5, October 1971, pp. 205-206.

Discusses the contributions digital computers have made to technological forecasting by eliminating tedious calculations through incorporation of curve-fitting techniques necessary to the analysis.

1686. Martino, J. P., "Technological Forecasting in the U.S. Air Force", *The Futurist*, v. 5, no. 6, December 1971, pp. 251-252.

Describes and briefly compares the past use of technological forecasting by the U.S. Army, Navy, and Air Force; describes the Air Force's new planning procedure in which both normative and exploratory technological forecasting will have carefully defined roles to play and forecasts will be updated every 2 years.

TECHNOLOGY ASSESSMENT

1687. Strasser, G., "What's in a Name?", *The Futurist*, v. 5, no. 6, December 1971, p. 240.

States that today the term "Technology Assessment" is misleading and limited, and, thus leads to confusion and controversy; believes that a new name is needed and suggests the acronym

PAYOFF – Plans and Assessments to Yield Options for the Future.

1688. Kash, D. E., and White, I. L., "Technology Assessment: Harnessing Genius", *Chemical & Engineering News*, v. 49, no. 49, 29 November 1971, pp. 36-41.

Defines technology assessment as a "mechanism for keeping tabs on the potential dangers, as well as the benefits in new technology", cites examples and proposes a large-scale network of interdisciplinary assessment programs in universities; 11 references.

1689. Zettel, R. M., "Technology Assessment: The Concept and the Practice", *Chem. Tech.*, September 1971, pp. 520-527.

Defines technology assessment as a systematic appraisal of harmful and beneficial consequences of a technological activity; describes in detail the performance and structuring of this kind of assessment, as well as its application and importance in private-sector activity.

1690. Kiefer, D. M., "Assessing Technology Assessment", *The Futurist*, v. 5, no. 6, December 1971, pp. 234-239.

Notes the expansion of the scope of technology assessment (from traditional concerns with feasibility and economic profitability) to include assessment of indirect or second- and higher-order effects and social impacts; examines such questions as who will perform technology assessments, and how and where they will be made.

1691. *MITRE-OST Technology Assessment Series*, a 7-volume report to the White House, 1971. (Available from National Technical Information Service, Springfield, Va. 22151. Price: $31.50 for complete set, PB202778; $6.00 for individual volumes, PB202778-01 thru 06; $3.00 for PB202778-07; $9.00 for complete set in microfiche.)

Covers the impact of technology in 5 major problem areas as cases, to uncover general principles of TA and to use these principles to develop an analytical framework and procedure for anticipating the social impacts of any major technological shift; reports are titled *Basic Propositions* (236 pp.), *Automotive Emission Controls* (181 pp.), *Computers-Communications Networks* (236 pp.), *Industrial Enzymes* (199 pp.), *Sea Farming* (180 pp.), *Water Pollution: Domestic Wastes* (301 pp.), and *A Summary* (30 pp.).

1692. "Making Technology Assessable", *Innovation*, no. 25, October 1971, pp. 57-59.

Discusses the problem of "finding the best way to link the assessment procedure to the interpretive process that must follow"; states that a technology to assess technology is needed; discusses H.R. 10243, a proposed bill involving establishment of an Office of Technology Assessment.

1693. Davis, J. W., "Technology Assessment", *Congressional Record*, v. 117, no. 176, 17 November 1971, p. E12361.

Rep. Davis reviews some programs for technology assessment (George Washington University, University of Oklahoma, Cornell

University, and MITRE); stresses the need for an Office of Technology Assessment within Congress.

1694. **"Daddario's Kite Flies Yet"**, *Nature,* **v. 233, no. 5316, 17 September 1971, p. 159.**

Describes Congress' unwillingness to table a bill establishing an Office of Technology Assessment which would appraise the impacts of the applications of technology and help Congress determine relative priorities of the projects before it; describes the Office and some of its duties.

1695. **Steed, T., "Science and Public Policy Program, University of Oklahoma – Statement of Goals"**, *Congressional Record,* **v. 117, no. 161, 28 October 1971, p. E11387.**

Describes plans to take the interdisciplinary-team approach to technology assessment, the first team organized to focus on oil production and transportation in offshore areas and the second to focus on biomedicine.

TECHNOLOGY TRANSFER

1696. **Doctors, S. I.,** *The NASA Technology Transfer Program: An Evaluation of the Dissemination System,* **Praeger Special Studies in U.S. Economic and Social Development, Praeger Publishers, 111 Fourth Ave., New York, N.Y. 10003, November 1971, 225 pp. ($15.00)**

Analyzes information from 44 interviews with client firms of the New England Applications Research Center and questionnaire replies from a number of clients of Aerospace Applications Research Center and concludes that the NASA program has disseminated much useful literature, but has not transferred technology commensurate with the cost; recommends emphasis on technology transfer, with an increasingly market-oriented approach; contains a selected bibliography and index.

1697. **Foster, R. N., "Organize for Technology Transfer"**, *Harvard Business Review,* **v. 49, no. 6, November-December 1971, pp. 110-120.**

Discusses steps in the technology-transfer process: create a resource base, define needs and markets, identify approaches relevant to the problems involved, evaluate alternatives and select best technology, develop and adapt the technology; suggests means of organizing; presents an example problem in an appendix.

1698. **Robbins, N., Jr., "The Engineer's Knowledge: Is It Transferable from One Industry to Another?"**, *Mechanical Engineering,* **v. 93, no. 10, October 1971, pp. 26-28.**

Considers three successful and two unsuccessful case histories of transfer from the aerospace and defense industries to the commercial world; concludes that the transferability of an engineer is high, but is inversely proportional to his previous experience, training, and degree of specialization.

1699. **Roush, J. E., "Consumers of Technology"**, *Congressional Record,* **v. 117, no. 177, 18 November 1971, pp. E12376-12378.**

Discusses the need for coordinating Federal efforts at technology transfer, specifically transfer of technology gained from defense, atomic energy, and space research to other areas (communications, medical diagnoses), to both private and public sectors; states that only in this way can we receive the fullest benefit from funds spent on research.

1700. **Dominick, D. D., "Technology Transfer and Water Resources",** *Chem Tech,* **October 1971, pp. 588-591.**

Describes the Environmental Protection Agency's Water Program Office's new integrated approach to the environmental crisis by operating a technology-transfer program aimed at the needs of engineers, administrators, and the general public; the program uses demonstration projects for illustration and instruction; describes a few such demonstration projects and recent advances made in pollution abatement.

1701. **Bar-Zakay, S. N., "Policymaking and Technology Transfer: The Need for National Thinking Laboratories",** *Policy Sciences,* **v. 2, no. 3, Summer 1971, pp. 213-227.**

Points out that National Thinking Laboratories are urgently needed, particularly by developing countries, to promote organized technology transfer and to act as catalysts to organized policymaking; elucidates the terms policymaking and technology transfer, and lists 5 general functions of NTL.'s.

TRANSPORTATION

1702. **"DOT Sets a New Course",** *Astronautics & Aeronautics,* **v. 9, no. 10, October 1971, pp. 12-14.**

Discusses a statement by J. A. Volpe, Secretary of the Department of Transportation, which proposes transportation revenue sharing, the reorganization of the Executive Branch including DOT, and the reexamination of the Government's economic regulation of the transportation industry; lists some recent moves by the DOT exemplifying this policy.

1703. *Institutional Factors In Civil Aviation,* **Report DOT TST-10-1 and NASA CR-1807, prepared by Arthur D. Little, Inc., for the Joint DOT-NASA Civil Aviation R&D Policy Study, January 1971, 223 pp. (Available from National Technical Information Service, Springfield, Va. 22151. Price: $3.00.)**

Identifies institutional factors which inhibit the civil aviation R&D process by which new and improved systems and equipment are developed and used; postulates and evaluates alternative methods of alleviating these constraints to meet the needs of domestic civil air transportation and contribute to broader national goals; includes comprehensive reviews of the R&D management process at the Federal level, and the legal and regulatory process as constraints on civil aviation R&D.

1704. *A Historical Study of the Benefits Derived from Application of Technical Advances to Civil Aviation,* **Vol. I – Summary Report and Appendix A, DOT TST-10-2 and NASA CR-1808; Vol. II –**

Appendixes B thru I, DOT TST-10-3 and NASA CR-1809; prepared by Booz, Allen Applied Research, Inc., for the Joint DOT-NASA Civil Aviation R&D Policy Study, February 1971, 179 pp. (Vol. I) and 408 pp. (Vol. II). (Available from National Technical Information Service, Springfield, Va. 22151. Price: $3.00 for Vol. I and $6.00 for Vol. II.)

Identifies expenditures for aeronautical R&D from 1945 to 1971, the technical advances that resulted, and the benefits derived from applying these advances to civil aviation; establishes criteria for assessing benefits and quantifies them where possible, utilizing as a gage the impact of developments on performance of aircraft and related systems; tests the methods on detailed case studies.

1705. *Joint DOT-NASA Civil Aviation Research and Development Policy Study*, Report DOT TST-10-4 and NASA SP-265, March 1971, 103 pp. (Available from National Technical Information Service, Springfield, Va. 22151. Price: $3.00.)

Presents the findings by a multiagency study group that examined policies affecting civil aviation, the problems confronting it, and its future potential; concludes that 3 priority areas deserve intensive effort: noise, congestion, and low-density, short-haul service; notes the importance of continued Government support for civil aviation R&D, with increased emphasis on nonphysical sciences such as economics and sociology.

1706. *Joint DOT-NASA Civil Aviation Research and Development Study, Supporting Papers*, DOT TST-10-5 and NASA SP-266, March 1971, 245 pp. (Available from National Technical Information Service, Springfield, Va. 22151. Price: $3.00.)

Presents analyses upon which Ref. 1705 is based; discusses missions (commercial passenger service, air cargo, and general aviation), system elements (air vehicles, traffic control, airports, and complementary surface transportation), special considerations (environmental, financial, military, and foreign competition), policy (issues and institutional factors), and benefits from aeronautical R&D; includes analyses of characteristics and growth to date, current problems, future needs, potential solutions, implications for R&D, and recommendations.

1707. *Selected Sources of Information on Transportation: Aviation*, 1971, 13 pp. (Available free from National Referral Center, Science and Technology Division, Library of Congress, Washington, D.C. 20540.)

Consists of an "informal" guide to 59 organizations which provide information on aviation aspects of transportation.

1708. Schmidt, C. F., "Pointing the Way for Air Transport Technology", *Astronautics & Aeronautics*, v. 9, no. 10, October 1971, pp. 63-67.

Presents condensations of sections of the summary report submitted by the AIAA-FAA Air Transportation and Society Conference to the Federal Aviation Administration; describes the objectives of the Conference; concludes that with the negative feelings toward aviation existing in this "age of ecology", positive contributions of aviation to social development must be increased.

1709. Miller, G. P., "NASA", *Congressional Record*, v. 117, no. 196, 14 December 1971, pp. H12545-12546.

Discusses the seriousness of the U.S.'s dwindling international lead in aeronautical research; reviews recent programs by the National Aeronautics and Space Administration directed toward reducing aircraft noise levels and pollution and toward vertical takeoff and landing planes as a solution to the transportation problem; urges full support of Congress for such research.

1710. Watkins, H. D., "Rail Trends Spur Airline Concern", *Aviation Week & Space Technology*, v. 95, no. 18, 1 November 1971, pp. 26-27.

Describes the conflicts beginning to emerge between the U.S. airlines and the new national system of passenger rail transportation as a result of changes in Government policy emphasizing rail transportation in some key markets.

1711. Miller, R. H., "Breaking the Automobile Barrier in Ultra-Short-Haul Transportation", *Astronautics & Aeronautics*, v. 9, no. 10, October 1971, pp. 68-77.

Analyzes whether VTOL aircraft (vertical takeoff and landing) can remove the grip of the private car on short-haul service, using Boston as a model; examines cost-time and pollution factors of intercity aircraft systems.

1712. Reuss, H. S., "The Garwin SST Report: A $425 Million Misunderstanding", *Congressional Record*, v. 117, no. 134, 16 September 1971, pp. H8553-8558.

Rep. Reuss critizes the Administration's withholding of the Garwin report on the SST (dated March 1969, but not released until August 1971), which refuted Administration arguments for the SST and recommended the program be terminated immediately — a move which would have saved $425 million; reprints the Garwin report.

1713. Proxmire, W., "Disposition of SST Technology", *Congressional Record*, v. 117, no. 144, 30 September 1971, pp. S15536-15537.

Presents 2 letters and an editorial offering suggestions for the U.S. Government's disposition of $1.1 billion worth of SST technology, e.g., that data and equipment from the project be made available to industry; cites the valuable lessons learned from the failure of the SST program.

1714. Yaffee, M. L., "New Rapid Transit System Tested", *Aviation Week & Space Technology*, v. 95, no. 19, 8 November 1971, pp. 44-47.

Describes the plans for a prototype personal rapid transit (PRT) system to be constructed and tested at Morgantown, W. Va.; cites the potential of PRT's for solving airport transportation problems, and their value as an outlet for the aerospace industry's systems engineering and innovative and integrative technological capabilities.

1715. Gilluly, R. H., "Transportation in the Cities: Pessimism over Solutions", *Science News*, v. 100, no. 15, 9 October 1971, p. 250.

Points out that U.S. urban mass transit is woefully behind that of many other countries and describes the desperate need to provide mass transportation as an integral part of any urban

community; contends that not enough money is being spent for education and research on urban mass transit.

1716. Agnew, S. T., "Urban Fast Mass Transportation", Address given at the International Conference on Urban Transportation, Pittsburgh, Pa., 8 September 1971, *Congressional Record*, v. 117, no. 132, 14 September 1971, pp. E9562-9564.

Vice President Agnew discusses the problems of urban transportation and their solution — efficient, dependable, low-cost public transportation; describes systems of mass transportation at work in other nations and systems being developed in the U.S. as a result of liberal funding ($10 billion over the next 12 years) for capital equipment and R&D on urban transportation problems.

1717. Allott, G., "Urban Mass Transportation", *Congressional Record*, v. 117, no. 157, 20 October 1971, pp. S16600-16601.

Points out that the Federal Government will spend close to $1 billion for urban mass transit in FY 1972, and argues in favor of permitting each local area to select the mode or modes of transportation that will best serve its needs rather than yield to pressures that favor highways over rails; presents a letter from Sen. Case to DOT Secretary Volpe urging full backing for a rail transit program for the cities.

1718. *Recommendations for Northeast Corridor Transportation, v. 1, Summary Report* (57 pp.); *v. 2, Main Report* (6 Sections); *v. 3, Technical Appendixes* (4), Final Report of U.S. Department of Transportation, September 1971. (Available within limits of supply, from Public Information Office, U.S. Department of Transportation, 400 Seventh St., S.W., Washington, D.C. 20590.)

Describes the recommended policy actions necessary to solve the Region's future short-haul intercity passenger transportation problems, with emphasis on common carriers and highway improvements as means of relieving the most pressing problems in the interim 1970's, as well as action necessary now to assure adequate lead time for long-term solutions in the 1980's; presents a comparative analysis of alternatives.

1719. Moss, F. E., "Highways Versus the Environment", *Congressional Record*, v. 117, no. 186, 2 December 1971, pp. S20100-20103.

Reprints four reviews of the book *The Pavers and the Paved* by A. B. Kelley, which challenges the wisdom of prohighway decisions by Congress and warns of their longer-range economic, social and environmental consequences.

UNITED KINGDOM

1720. "Rothschild v. Dainton: Who's Right?", *New Scientist*, v. 52, no. 772, 2 December 1971, pp. 14-16.

Presents three articles, by different authors, which compare, contrast, and criticize 2 reports, one by Lord Rothschild and the other by Sir F. Dainton, published in a "green paper" entitled, *A Framework for Government Research and Development*, concern-

ing the reorganization of science and Science Research Councils in Britain; Rothschild emphasizes the need for "applied R&D" and proposes a customer-contractor relationship between Government Departments and (weakened) Research Councils; Dainton advocates strong Research Councils and classifies science as tactical, strategic, or basic, rather than as pure or applied.

1721. "Research Councils: Rallying of the Clans", *Nature*, v. 233, no. 5319, 8 October 1971, pp. 364-365.

Describes the U.K.'s Natural Environment Research Council (NERC) annual report (HMSO, £0.85), which comments on the controversial Dainton investigation of the organization of the U.K.'s civil sciences, outlines the Council's new committee structure, and reviews how its £14 million budget was expended during the past year.

1722. Flowers, B., "Science and the Common Market", *Nature*, v. 233, no. 5316, 17 September 1971, pp. 173-176.

Flowers, Chairman of the British Science Research Council, describes the benefits to U.K. science and industry of entry into the Common Market; discusses criteria for success of European scientific organizations (e.g., CERN, ESRO, ELDO, Euratom, and EMBO) and what joining the Common Market would mean economically and politically to Britain's scientific and industrial communities.

1723. "U.K. Scientists Organize Trade Union", *Chemical & Engineering News*, v. 49, no. 39, 20 September 1971, p. 26.

Describes the organization of a trade union for professional scientists in the United Kingdom, called the Association of Professional Scientists and Technologists (APST), in response to pressure for a representative body to bargain with employers of scientists.

1724. "Plans for Manpower", *Nature*, v. 233, no. 5319, 8 October 1971, p. 366.

Mentions the U.K. Science Research Council's plans to limit the number of new postgraduate SRC studentships in 1972 to 3,850, according to the 1970-71 SRC report (HMSO, £0.65); notes that SRC supports about half the British research students, with the remainder funded from university, industrial, and private sources.

1725. Sherwood, M., "Why Don't CAPS Fit?", *New Scientist and Science Journal*, v. 51, no. 770, 23 September 1971, pp. 695-696.

Describes the U.K. Science Research Council's industry-academic Cooperative Awards in Pure Science (CAPS) program, now in its 5th year, which provides 3-year studentships leading to PhD degrees and contracts later in industry; discusses possible reasons for the lack of qualified applicants, in the face of increasing graduate unemployment.

1726. "Significant Statistics", *Nature*, v. 234, no. 5325, 19 November 1971, p. 117.

Presents statistics showing that the number of first degree graduates of British universities furthering their studies in the pure sciences was greater in 1969-70 than in 1968-69, while the

number embarking on applied science research was less.

1727. "Reform by Inches or Half-inches", *Nature*, v. 233, no. 5316, 17 September 1971, pp. 151-152.

Critically describes the present makeup of the British Association for the Advancement of Science, whose survival is threatened because of its outmoded administration; suggests that the association form a clear vision of its objectives, which should include the encouragement of an informed opinion on public issues and the fostering of European collaboration in science, and then modernize its organization to accomplish them.

1728. Smith, A., "Contract Research is Booming in Britain", *Science Forum*, v. 4, no. 5, October 1971, pp. 18-19.

Discusses the steady but unspectacular growth of contract research in England and the increased use by industry of private contract research organizations, resulting in higher revenues and higher employment of research workers, contrary to the U.S. experience.

1729. Magnuson, W. G., "Nuclear Power in Britain", *Congressional Record*, v. 117, no. 172, 12 November 1971, pp. S18391-18393.

Presents a collection of 4 articles by A. R. Smith analyzing the British approach to nuclear-reactor development for the generation of electricity (siting atom plants in remote places, eliminating thermal pollution by using gas-cooled plants, exercising great care in establishing radiation and safety standards) which, according to Magnuson, has given Britain a worldwide lead in generation of electricity by nuclear energy.

1730. Hawkes, N., "Britain: Nuclear Power Industry Faces Critical Choice on Reactor", *Congressional Record*, v. 117, no. 175, 16 November 1971, pp. E12264-12265.

Presents a very bleak picture of the development and present state of the nuclear power industry in the United Kingdom, in contrast to Magnuson's rosy report (Ref. 1729).

1731. Fells, I., "Fuels and the Future", *New Scientist and Science Journal*, v. 52, no. 773, 9 December 1971, p. 70.

Discusses Britain's desperate need for an integrated fuels and energy policy; describes fuel companies' fighting over monopolies, which is not in the best interest of the consumer; believes that people should be urged to use less fuel, not more.

1732. "Select Committee Sees Room for Space", *New Scientist*, v. 52, no. 772, 2 December 1971, p. 24.

Reviews a report from the Select Committee on Science and Technology in Britain which concludes that "the United Kingdom does not have a centrally coordinated, overall space program" and recommends that the Government "make a statement clearly defining national space and objectives so that industry may meet the technological and investment challenge they present".

URBAN PROBLEMS

1733. Feller, I. (Ed.), *The Application of Science and Technology to Public Programs*, Papers, Recommendations, and Discussion of the Eastern Regional Conference on Science and Technology for Public Programs, Cambridge, Mass., 2-3 April 1970, August 1971, 521 pp. (Available from Center for the Study of Science Policy, Institute for Research on Human Resources, The Pennsylvania State University, University Park, Pa. 16802.)

Focuses on defining problems confronted by state and local governments stemming from rapidly expanding urbanization and consequent rural dislocation, in terms of the potential contribution that science and technology could make to their solutions — such problems as providing adequate housing, transportation, pollution control, health services, police and fire protection, education, and training; presents 6 addresses and summaries of the 24 workshops with recommendations on state science policies, on technology utilization programs, and on cooperation among Federal, State, and local agencies.

1734. Chartrand, R. L., "Hope for the Cities", *Congressional Record*, v. 117, no. 148, 6 October 1971, pp. E10550-10552.

Consists of the introduction, written by the editor, R. L. Chartrand, to a book (*Hope for the Cities*, Spartan Books, New York, 1971) which resulted from a series of seminars on Capitol Hill concerning the need for a national policy for environmental control; outlines and discusses steps that need to be taken to achieve this.

1735. Bazell, R. J., "Urban Health and Environment: A New Approach", *Science*, v. 174, no. 4013, 3 December 1971, pp. 1005-1006.

Describes the East Harlem Environmental Extension Service, a year-old program of manpower training and preventive maintenance of tenement housing that has had remarkable success in eliminating slum health hazards and saving buildings; discusses limitations imposed by extraordinary difficulties in obtaining funds.

1736. Taher, G. M. (Ed.), *University Urban Research Centers*, Second Edition, 1971-1972, The Urban Institute, 2100 M. St., N.W., Washington, D.C. 20037, 299 pp. ($2.75, paperback.)

Presents information on each of about 300 centers, including director, projects, staff, funding source, fields of interest, and publications; includes many centers devoted mainly to environmental issues; gives details on graduate programs in policy sciences at 6 U.S. universities and a special article about them ("Policy Sciences and the Market", by J. H. Lewis), describes the HEW-HUD experimental Urban Observatory program, and lists the Urban Observatories in ten cities; indexed by centers, universities, directors, and graduate programs.

1737. "Humans and Cities: The European Answer", *Science News*, v. 100, no. 19, 6 November 1971, pp. 308-309.

Reviews the book *Planned Urban Environments*, which describes some of the key European developments; points out that the

U.S. lags far behind Europe in urban planning; discusses the diverse approaches to such planning dictated by special needs and concerns of the country involved.

1738. Holden, C., "LeVaudreuil: French Experiment in Urbanism without Tears", *Science*, v. 174, no. 4004, 1 October 1971, pp. 39-41.
Describes plans to build an industrial city (Le Vaudreuil) 60 miles west of Paris, "designed from the earliest stages to control air, water, noise, and esthetic pollution", a French-American cooperative venture; discusses the benefits of this venture to France and the U.S.; discusses some U.S. reservations, as well as many merits of the venture.

U.S. SCIENCE POLICY

1739. "Signs of Change in Science Policy", *Nature*, v. 234, no. 5326, 26 November 1971, pp. 179-180.
Discusses attempts being made by the Administration to redirect R&D along lines that will help solve economic and social problems, and the impacts on basic and applied research; speculates on the significance of the appointment of William T. Magruder as consultant to the President, and the role he will play in deciding U.S. science policy.

1740. "Refocusing Policies", *Chemical & Engineering News*, v. 49, no. 46, 6 November 1971, p. 8.
Describes the New Technology Opportunities Program, headed by W. T. Magruder and being developed to formulate an "overall policy on research and development that will stimulate innovation in industry, provide incentives [such as tax cuts] for developing and applying technology to solve urgent social problems, and improve the competitive position of the U.S. in world markets".

1741. "Presidential Science Adviser Calls for More Industry Research", *Washington Science Trends*, v. 27, no. 6, 15 November 1971, p. 31.
Quotes E. E. David's appeal for industry to step up its R&D efforts, instead of irresponsibly cutting back just when the Government is trying to expand civilian R&D and establish major advanced technology project goals (which would require industry cost sharing); points out that National Association of Manufacturers executives are uneasy about the future of R&D funding by Government.

1742. "Too Little, Too Late?", *Industrial Research*, v. 13, no. 10, October 1971, p. 9.
Discusses the tax incentives to stimulate R&D of new industries and new technologies, as called for in President Nixon's new economic plan; urges the Administration "to form a long overdue national science policy, to make a firm commitment to this country's R&D effort, and to adopt a realistic attitude to the needs of science in a technological society".

1743. Sherwood, M., "David as Goliath", *New Scientist*, v. 52, no. 773, 9 December 1971, pp. 92-93.

Discusses with Edward E. David, Jr., President Nixon's science adviser, his life, job, and feelings about the future of science in the U.S.; David stresses the importance of the OECD Ministers of Science meeting held in Paris because it emphasizes the quality of life in future planning and for new initiatives in technology assessment as well as international cooperation at governmental level.

U.S.S.R.

1744. "Industrial Research", *Nature*, v. 233, no. 5322, 29 October 1971, p. 580.

Describes the recent "Scientists for Industry" seminar held in Rostov-on-Don where discussions revealed a lack of contact between R&D and industrial application in the Soviet Union; reviews an article from Pravda which stresses the need for the development of R&D laboratories within factories.

1745. "USSR: Nature Protection an Economic Necessity", *Science Policy News*, v. 3, no. 2, September 1971, p. 27.

Announces that the USSR's national economic plan for 1971-1975 will incorporate measures for the protection of nature; lists actions already being taken: new forest planting, use of closed-cycle water systems, development of devices to combat erosion, installation of water purifiers, use of gas and dust trap devices.

1746. "Soviet Civil Space Shakeup Seen", *Aviation Week & Space Technology*, v. 95, no. 15, 11 October 1971, pp. 14-15.

Discusses the possibility of major reorganization of the Soviet civilian space program because of technical failures, low morale, and rising political dissidence; describes the growing concern of U.S. scientists that such a reorganization might affect the newly launched U.S.-Soviet program of cooperation in space.

1747. "USSR: Economic Uses of Space Vehicles", *Science Policy News*, v. 3, no. 2, September 1971, p. 28.

Describes a new Soviet Book, *Space and Man*, dealing with "cosmonautics" as a science, and pointing out its relevance to geology, oceanology, and meteorology; several chapters deal with the use of automatic space devices in agriculture, forestry, transport, education, and culture.

1748. Brownlow, C., and Miller, B. (Eds.), "The Growing Threat — 1: Soviet Union's Technological-Military Drive", *Aviation Week & Space Technology*, v. 95, no. 14, 4 October 1971, pp. 12-15.

Describes the latest weapons and delivery systems being developed by the USSR in line with their alleged intent "to achieve a clear technological-military superiority over the U.S. by 1974-75"; fields where they already excel are listed as mathematical sciences, controlled fusion, energy accelerators, anti-satellite intercept, fractional orbital bombing systems, large payload boosters, remotely controlled space systems, and electrogeomagnetic research.

1749. Brownlow, C., and Miller, B. (Eds.), "The Growing Threat – 2: Soviets Stressing Offensive Mix of Strategic Arms for Which U.S. Has Little Defense", *Aviation Week & Space Technology*, v. 95, no. 15, 11 October 1971, pp. 36-41.

Described in this second part of a series detailing the growing techno-military threat of the Soviet Union is that country's recent increase in the number of offensive and defensive missile systems.

1750. Emelyanov, V. S., "Nuclear Energy in the Soviet Union", *Bulletin of the Atomic Scientists*, v. 27, no. 9, November 1971, pp. 38-41.

Emelyanov, deputy chairman of the State Committee of USSR Council of Ministers on Use of Atomic Energy and member of the Disarmament Commission of the USSR Academy of Sciences, traces the development of nuclear technology in the Soviet Union, including weapons studies, power-station construction at home and abroad, and controlled fusion research.

1751. *Soviet Medical Research Priorities for the Seventies*, A Publication of the Soviet-Eastern European Studies Project, John E. Fogarty International Center for Advanced Study in Health Sciences, January 1971, 17 pp. (Available from Department of Health, Education, and Welfare, Forgarty International Center, Public Health Service, National Institutes of Health, Bethesda, Md. 20014.)

Briefly describes the types of medical research given priority in the new Five-Year Plan for Medical Research (1971-1975): complex problems such as cardiovascular disease, cancer, environmental problems, and human genetics, and individual problems including morphology, influenza, tuberculosis, and aerospace medicine; discusses technological implementation of the plan and the Soviet Union's intention to support and expand international collaboration.

WEST GERMANY

1752. "Germany: 1969 R&D Expenditure in Business Enterprise Sector", *Science Policy News*, v. 3, no. 2, September 1971, pp. 25-26.

Presents figures from an article in *Wirtschaft und Wissenschaft*, no. 2, March/April 1971, comparing various aspects of 1967 R&D spending in the business enterprise sector (5.3 billion DM) with 1969 spending (7.4 billion DM), based on data from 853 firms representing about 4.5 million workers; data show an increase in Government spending from 9.3 to 15.1% of the total, while business' contributions fell from 89 to 83% between 1967 and 1969; of the Trade Associations, the biggest 1969 spenders were steel, engineering, and vehicle building (46%), mining (18%), and metals (6.6%).

YUGOSLAVIA

1753. Suica, J. S., "Power Development in Yugoslavia", *Bulletin of the Atomic Scientists*, v. 27, no. 9, November 1971, pp. 42-46.

Suica, vice-president of the Yugoslav Federal Nuclear Energy

Commission, discusses his country's economic development patterns and consequent need for a 6%/year growth rate in total primary energy to modernize industrial production and stimulate growth in less developed areas of the country; outlines the potential and plans for conventional thermal and hydroelectric plants, and looks to nuclear plants to carry the lion's share (to 23,000 Mw) by the year 2000.

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